Environmental Impact Assessment

for

Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans
(Draft)

Owner: Hongya County Housing and Urban-Rural Construction Bureau
Evaluated by: Southwest Jiaotong University

July 2015
CONTENTS

Foreword ......................................................................................................................... 1
1.0 Introduction ................................................................................................................. 3
  1.1 Project background and construction necessity ....................................................... 3
  1.2 Purposes and principles for assessment .................................................................. 6
  1.3 Preparation basis ...................................................................................................... 7
  1.4 Assessment level and assessment scope ................................................................. 14
  1.5 Assessment standard .............................................................................................. 17
  1.6 Time for assessment and prediction ...................................................................... 19
  1.7 Assessment method ............................................................................................... 19
  1.8 Assessment content and key points of assessment ................................................ 20
  1.9 Conformance to industrial policy and planning .................................................... 20
  1.10 External environment relations and the environmental protection objects ........... 21
2.0 Project Overview ....................................................................................................... 25
  2.1 Project name, project location and construction type ............................................. 25
  2.2 Construction project composition .......................................................................... 25
  2.3 Overview of main works ....................................................................................... 26
3.0 Project Analysis ........................................................................................................ 36
  3.1 Analysis of environmental problems of the Project ............................................... 36
  3.2 Introduction to process flow during construction period ........................................ 37
  3.3 Introduction to process flow during operation period ............................................ 40
  3.4 Main impact source analysis during construction period ....................................... 40
  3.5 Environmental impact source analysis during operation period ............................ 45
4.0 Environment Overview and Status Assessment ....................................................... 51
  4.1 Natural environment overview ............................................................................. 51
  4.2 Environmental quality status survey and assessment ............................................. 51
5.0 Environmental Impact Assessment ......................................................................... 53
  5.1 Social Environmental Impact Assessment ............................................................. 53
  5.2 Ecological environmental impact assessment ....................................................... 55
  5.3 Acoustic environment impact assessment ............................................................. 60
  5.4 Water Environmental Impact Assessment ............................................................. 67
  5.5 Atmospheric environmental impact assessment .................................................... 71
  5.6 Solid Waste Environmental Impact Assessment ..................................................... 74
  5.7 Environmental Risk Impact Assessment ................................................................. 76
6.0 Water and Soil Conservation ................................................................................. 79
7.0 Resettlement Plan ................................................................................................... 80
8.0 Public Consultation ................................................................................................. 81
  8.1 Purpose of public consultation .............................................................................. 81
  8.2 Implementation of public consultation survey ....................................................... 82
  8.3 Statistical analysis on survey results ....................................................................... 85
9.0 Environmental Protection Measures and Techno-Economic Feasibility ................. 88
  9.1 Environmental protection measures during design stage ...................................... 88
  9.2 Measures to prevent pollution and mitigate impact during construction period .... 90
  9.3 Measures to prevent pollution and mitigate impact during operation period ......... 96
  9.4 Investment estimation of environmental protection works .................................... 98
10.0 Environmental Protection Management and Environmental Monitoring ......... 101
  10.1 Environmental protection management ............................................................... 101
  10.2 Environmental monitoring plan ........................................................................... 105
  10.3 Environmental supervision plan .......................................................................... 111
11.0 Economic Cost-benefit Analysis on Environmental Impact ............................... 117
  11.1 Purpose of environmental economic cost-benefit analysis .................................. 117
11.2 Method of environmental economic cost-benefit analysis ........................................ 117
11.3 Social benefit analysis ............................................................................................. 117
11.4 Environmental benefit analysis................................................................................ 118

12.0 Environmental Impact Assessment Conclusion ...................................................... 121
Figures
Figure 1  Project Location Map
Figure 2-1 General Plan of Project Area (Hongchuan Town)
Figure 2-2 Drainage Plan of Project Area (Hongchuan Town)
Figure 2-3 General Plan of Project Area (Liujiang Town)
Figure 2-4 Road Plan of Project Area (Liujiang Town)
Figure 2-5 Water Supply Plan of Project Area (Liujiang Town)
Figure 2-6 Drainage Plan of Project Area (Liujiang Town)
Figure 3-1 General Layout of Hongchuan Town Subproject
Figure 3-2 General Layout of Liujiang Town Subproject
Figure 3-2-1 General Layout of Road of Liujiang Town
Figure 3-2-2 Layout Plan of Water Purification Plant of Liujiang Town
Figure 3-2-3 General Layout of Ecological Parking Lot of Liujiang Town
Figure 3-2-4 General Layout of Water Supply Pipe Network of Liujiang Town
Figure 4-1 Map of External Environmental Relations and Monitoring Point Distribution of
Hongchuan Town Subproject
Figure 4-2-1 Map of External Environmental Relations and Monitoring Point Distribution of
Liujiang Town Subproject (Overall)
Figure 4-2-2 Map of Liujiang Town External Environmental Relations and Monitoring Point
Distribution of Liujiang Town Subproject (Local 1)
Figure 4-2-3 Map of Water Purification Plant External Environmental Relations and
Monitoring Point Distribution of Liujiang Town Subproject (Local 2)
Figure 5-1 Map of Present Land Use of Hongchuan Town Subproject
Figure 5-2 Map of Present Land Use of Liujiang Town Subproject
Figure 6  Water System Map of Project Area
Figure 7  Soil Erosion Map of Project Area
Figure 8  Vegetation Distribution Map of Project Area
Figure 9  Hydrogeological Map of Project Area
Figure 10 Design Sketch of Standard Cross-section of Liujiang Town Subproject
Figure 11 Bridge Map of Liujiang Town Subproject

Annexes
Annex 1  Project Approval Document
Annex 2  Executive Standards for Environmental Protection of the Project
Annex 3  Planning & Construction Bureau Document on the Project
Annex 4  Water Resource Feasibility Report and Approval of Water Purification Plant in
Liujiang Town Subproject
Annex 5  Water and Soil Conservation Scheme and Approval of the Project
Annex 6  Resettlement Action Plan of the Project
Annex 7  Project Land Documents
Annex 8  Flood Drainage Description of the Project
Annex 9  Document of Description and Delineation of Drinking Water Sources of the
Project
Annex 10 Assessment of No Rare Animals and Plants in the Project
Annex 11  Project Monitoring Report
Annex 12 Public Consultation Sample Questionnaire and Respondent List of the Project
Annex 13 Power of Attorney of the Project
Foreword

Hongya County has already determined in 2009 to implement the “Diverting Water from Qingyi River to the City” Project with the support of World Bank’s loan, and the project passed the World Bank appraisal in August 2010. The “Diverting Water from Qingyi River to the City” (Diversion Canal) Project is undertaken by Hongya county government, with a total length of 9200 meters and an estimated investment of RMB 104,816,600. The development organization of the project is Planning and Construction Bureau of Hongya County, and the construction companies are Zhejiang Provincial No.1 Water Conservancy & Electric Power Construction Group Holdings Co., Ltd. and Hunan Greenwood Urban Landscape Engineering Co., Ltd. The project includes water drainage, river training and water diversion works, and started construction from July 2013. It has proceeded smoothly after land requisition and resettlement in the early state, and currently, the 9km diversion canal for diverting water from Qingyi River to the city along with the harnessing of the moat at south and north of the city has been completed, promoting the reconstruction of the old city of Hongya County, improving the water system landscape along the canal, optimizing the land use pattern of the city, and improving the environmental quality.

The Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans was officially put forward based on the above mentioned conditions, which is the improvement and extension of the “Diverting Water from Qingyi River to the City” Project of Hongchuan Town, and will improve the municipal infrastructure of Liujiang Town (a famous ancient town) and life quality of the residents of and tourists to Hongya County. In June 2014, the Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans. In August 2014, the Hongya County Housing and Urban-Rural Construction Bureau prepared the Project Proposal for the Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans. In this Project Proposal, apart from the improvement and extension of the above mentioned “Diverting Water from Qingyi River to the City” Project of Hongchuan Town, the improvement for the municipal infrastructure of Liujiang Town (another critical tourism town of Hongya County) is also included in the project construction.

According to the World Bank Loan—Feasibility Study Report on Hongya County Restructuring Component of Sichuan Small Towns Development Project: Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans is divided into two subprojects, i.e. Hongchuan Town Subproject and Liujiang Town Subproject. The former includes 1) River channel works: river dredging 2.2km, desilting 106,800 m³; riverine wetland governance 6.37801ha (about 95.62 mu); new river bank construction 2.2km, and river bank repair and renovation 1.8km. 2) Sewage pipe works: sewage pipe laying 2.35km. The latter includes 1) road works: new road construction 1.39km, and road reconstruction 0.97km. The road width is 8-12m as per the planning, meanwhile, underground pipe network, lighting, signs, mark lines, etc. will be provided. 2) Bridge works: 3 new bridges (1 foot bridge and 2 vehicular bridges). 3) Urban rainwater garden works: new public green land 67312.17m², a total of 100mu. Build a complete urban rainfall flood management system and provide a public green land resource for daily leisure of the residents and the tourists by adopting the green infrastructure concept combining with road rainwater regeneration system, etc. 4) Water purification plant and pipe network project: 1 new water purification plant covering an area of 7.5mu, with short term (2020) capacity of 2500m³/d and long term (2030) capacity of 4500m³/d; and the new water transportation pipeline 12km. 5) Digital urban works: create various data resource platforms like geospatial framework data, unit grid data, management part data and geocoding data platforms to
form a complete, closed and interconnected digital urban works management system. 6) Ecological parking lot: construct a single-layer ecological parking lot with a floor area of 7954m², and 237 vehicular parking places (228 for private cars and 9 for buses) and 60 bicycle parking places (for public rental).

According to relevant provisions of the Environmental Protection Law of the People’s Republic of China, the Law of the People’s Republic of China on Appraising of Environment Impacts and the Regulations on the Administration of Construction Project Environmental Protection, Southwest Jiaotong University was entrusted by the Hongya County Housing and Urban-Rural Construction Bureau to undertake the environment impact assessment work of that project and compile the Environmental Impact Assessment. After accepting the entrustment, the assessment unit established the project team to conduct the work as per the principles, methods, contents and requirements specified in the Technical Guideline for Environmental Impact Assessment. With the great help of the local government, the staff of the project team conducted the field reconnaissance and the environmental investigation in detail for the environmental sensitive points like the main residential area of the project implementation area, etc., and listened to the opinions of relevant departments and the masses, and collected the information widely. They also conducted a detailed investigation, consultation and opinion exchange work for the departments in the region where the project is located, like competent department for environmental protection, relevant department for implementing the land acquisition and resettlement work, urban planning department, water department, etc., sent the opinion consultation forms for the directly affected masses and recorded relevant opinions; carried out the monitoring work for atmospheric environment, water environment, acoustics environment as well as bottom mud of the moat of Hongchuan Town, and finally completed this Report in June 2015.

With the substantial support of numerous departments and relevant specialists in preparation of the Report, the environmental monitor station of Hongya County completed this monitoring work for relevant environmental factors of the assessment, and we hereby would like to express sincere thanks!
1.0 Introduction

1.1 Project background and construction necessity

1.1.1 Project background

Hongya County has already determined in 2009 to implement the “Diverting Water from Qingyi River to the City” project by World Bank loans, and it has passed the World Bank Project Assessment in August 2010. The “Diverting Water from Qingyi River to the City” (diversion canal) project undertaken by the county government has a total length of 9200 meters, and estimated investment of RMB 104,816,600. The project owner is Planning and Construction Bureau of Hongya County, and the construction unit is Zhejiang Provincial No.1 Water Conservancy & Electric Power Construction Group Holdings Co., Ltd., and Hunan Greenwood Urban Landscape Engineering Co., Ltd. The work has been carried forward smoothly through earlier stage land requisition and demolishing resettlement, currently, 9 Km. diversion canal construction of the “Diverting Water from Qingyi River to the City” project along with the harnessing of the moat at south and north of the city has been completed, promoting the reconstruction of the old city of Hongya County, improving the water system landscape along the canal, optimizing the land use pattern of the city, and improving the environmental quality.

Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans was officially put forward based on the above mentioned conditions, which is aimed to improve and extend the “Diverting Water from Qingyi River to the City” project of Hongchuan Town, and improve the life quality of the residents of and tourists to Hongya County through improving the municipal infrastructures of Liujiang ancient town. In June 2014, the Hongya County Housing and Urban-Rural Construction Bureau filled out the Project Screening Schedule in respect of the Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans. In August 2014, the Hongya County Housing and Urban-Rural Construction Bureau prepared the Project Proposal for Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans.

1.1.2 Construction necessity

I. Demands for improving the urban flood control standard to ensure the life and property safety of the residents

Hongchuan Town Subproject is closely related to the Hongchuan town environmental comprehensive control subproject of Sichuan Small Towns Development Project by World Bank Loans.
loans. The important purpose of Hongchuan Town environmental comprehensive control subproject of Sichuan Small Towns Development Project by World Bank loans which is implementing by our county is to clear the sludge and bury the sewage interception trunk pipe by dredging the old riverways (channels) within the city, and introduce river water with Class 2 water quality (10m³/sec), and make the river water flows through the city from the west to the east by two riverways (channels) in north and south to comprehensively improve the urban ecological environment and purify the water environment.

II. Demands for improving the ecological environment to improve the life quality of the residents

Hongchuan Town Subproject is located downstream from the Hongchuan Town environmental comprehensive control subproject, and the existing ecological environment is very poor, and the Class 2 water quality of the introduced Qingyi River water can be maintained only after it is fully renovated and flows back to Qingyi River, thus the ecological balance idea of “return the borrowed water with good quality water” can be achieved, and ensure the integrity of Hongchuan Town environmental comprehensive control subproject of Sichuan Small Towns Development Project by World Bank loans. In conclusion, construction of the project is necessary and shall be carried out as soon as possible. The project is an improvement and extension for the important purpose of Hongchuan Town environmental comprehensive control subproject of Sichuan Small Towns Development Project by World Bank loans, and the adhering idea has a high degree of unity.

III. An extension and improvement for Phase I project by World Bank loans, and demands for increasing the social and environmental benefits of Phase I project.

Hongchuan Subproject is located downstream from the Phase I project, and the ecological environment of the existing riverway is very poor, the sludge is deposited and the sewage discharge is in a mess. If it is not renovated timely, it will lead to the Qingyi River water introduced by Phase I project being seriously polluted after flowing through that section and the water quality of the Qingyi River will be further polluted after it is merged in the Qingyi River and significantly reduce the social environment benefit of the Phase I project. Therefore, in order to return the introduced Qingyi River water to the Qingyi River with original Class 2 water quality and achieved the ecological balance idea of “return the borrowed water with good quality water” and “introduce the Qingyi River water into the city and return good quality water to the Qingyi River”, the riverway of this section must be comprehensively renovated.

Though the Phase I project impactively improved the flood-control capacity and the riverway environment of the old city section, it is only implemented to Fenghe Bridge. The Fenghe Bridge
to Niujiao bay (Zhuhekan village) section, namely, the join section of inland river and the Qingyi River currently is still deposited with sludge, the river bank is missing and the flood-control capacity is poor. However, that section is currently the planning development of Hongya County, therefore, improving the river bank of that section and promoting the flood-control capacity have a important impact on promoting the development of the Hongya County and ensuring the life and property safety for the residents near the riverway in future.

IV. Improving the internal and external traffic of the ancient town and meeting the demand of travel.

For the Liujiang Town Subproject, the road infrastructure of the Liujiang district as the core area of ancient town of Liujiang Town significantly falls behind. The road surface is narrow and the road condition is poor, and all of the roads are substandard roads. As per the position of the Liujiang ancient town as the west gate of Emei tourist attraction, such behindhand road net condition will definitely affect the local tourism and economic development, thus hindering the local residents to improve their current living conditions. Therefore, the construction for the road infrastructure of Liujiang core area is not only the demand for improving the current living conditions for the residents, but also provides a strong guarantee for the tourism development of Liujiang, so its construction demand is impending.

V. Improving the water supply/discharge safety and quality for the ancient town and meeting the basic needs in daily life

For the Liujiang Town Subproject, another prominent problem of the Liujiang district is the current water drainage system is in a mess, and there was no corresponding water drainage facility. For the Huaxi River where Liujiang is located, lots of water channels and ditches are dried up, the rubbish and fallen leaves are piling up in the ditches, and the natural environment of Liujiang is seriously affected; it is very unfavorable for the ecological environment of the core area of Liujiang ancient town, and affects its development of tourism economy. Therefore, the regional ecological environment is improved through renovation of the ditches based on the eco2 town development idea to promote the industrial development and achieve the benign interaction between them.

Currently, there is no available tap water factory within the township. The water for the township is currently supplied by the Liujiang Water Supply Station upstream from Yangcun River, the water supply scale is only 1000m$^3$/d, and the water source is the spring water of Liugou Mountain. But with the speeding up of the construction and the improvement of construction standard of Liujiang, the crude water supply station is no longer able to meet the increasing urban water demands, and the development demand of Liujiang must be supported through constructing
new and modern tap water factory and water transport and distribution pipe network.

1.2 Purposes and principles for assessment

1.2.1 Assessment purposes

The primary purpose for the Environmental Impact Assessment as one system for environmental protection management of the construction project is to implement the basic state policy of “protect the environment” and seriously carry out the environmental management policy of “prevention first, combine the prevention and treatment”. As per the provisions of the *Law of the People’s Republic of China on Appraising of Environment Impacts* and the No. “253” Decree of the State Council, in order to implement the sustainable development strategy, prevent the adverse impact on the environment caused by the implementation of the planning and the construction project, strengthen the environmental protection management for the construction project, strictly control the new pollution, and protect and improve the environment, the Environmental Impact Assessment work must be conducted for all new, expansion and technical renovation works. The specific purposes of the assessment are shown as below:

(1) Achieve the harmonious development of the local municipal infrastructure construction with the nature, economy and environment, namely, the construction of the project is based on the idea of “sustainable development”.

(2) Analyze and demonstrate the reasonability of the construction scheme from the perspective of environmental protection.

(3) Conduct the forecast assessment for the impact on the surrounding environment during construction period and the operational period caused by the project through the current situation investigation and analysis for the natural and social and ecological environment, etc., of the place where the project is located.

(4) Put forward practical and feasible environmental protection measures and suggestions as per the influence degree of the project on the environment to minimum the adverse impact on the environment caused by the works and achieve the purpose of coordination of project construction and environmental protection.

(5) Make the citizens near the project join the environmental protection demonstration of the project construction through public consultation, making the project construction and environmental Impact assessment more democratic and scientific. Guide the public to participate in the supervision of the environmental protection during project construction period and operational period, and playing the role of promoting relevant state environmental protection laws and regulations and policies to some extent.
1.0 Introduction

1.2.2 Assessment principles

(1) Seriously implement the national and local environmental protection laws, regulations and relevant provisions, and conduct the site investigation and environmental impact assessment work as per relevant state technical codes.

(2) Adhere to the principles of combining taking full advantage of existing data, on site reconnaissance and current state monitoring.

(3) Ensure the comprehensiveness of the assessment content, highlight the assessment key point and fully reflect the regional environmental characteristics and engineering environmental impact characteristics;

(4) Adhere to the objective, fair, scientific and practical principles.

1.3 Preparation basis

1.3.1 Environmental protection laws and regulations and relevant documents

(1) Environmental Protection Law of the People's Republic of China (implemented on January 1, 2015);

(2) Law of the People's Republic of China on Appraising of Environment Impacts (implemented on September 1, 2003);

(3) Law of the People's Republic of China on Prevention and Control of Pollution From Environmental Noise (implemented on March 1, 1997);

(4) Water Pollution Prevention and Control Law of the People's Republic of China (implemented on June 1, 2008);

(5) Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution (revised on April 29, 2000, and implemented on September 1, 2000);

(6) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Wastes (implemented on April 1, 1996);

(7) Law of The People's Republic of China on Water and Soil Conservation (implemented on March 1, 2011);

(8) Regulations on the Environmental Protection of Construction Project (No.253 decree of
the State Council of the People’s Republic of China, implemented on November 29, 1998);

(9) Notices on Implementation of Construction Project Environmental Protection (No.107 GJHBZJHF [1999] document, implemented on April 29, 1999);

(10) Notices on Implementation of Environmental Impact Assessment System for Construction Project (No.107 GJHBZJHF [1999], implemented on April 29, 1999);

(11) Notices on Further Strengthening the Environmental Protection Work for the Construction Project (No.19 decree GJHBZJHF [2001], implemented on February 21, 2001);

(12) Classification Catalogue for Construction Project Environmental Impact Assessment (implemented on October 1, 2008)

(13) Administration Methods of Environmental Protection in Transport Construction Item (No. 17 decree JTB [1990], implemented in 1990);

(14) Notices on Issuing the Regulations for Wafer and Soil Conservation Work for Road Construction Project (No. 12 decree SLBJTBSB [2001] document, implemented in 2001);

(15) Notices on Further Regulating the Environmental Impact Assessment Work (No. 88 GJHJBHZJHB [2002], implemented in 2002);

(16) Sichuan environmental protection regulations (implemented on September 24, 2004);

(17) Urban and Rural Planning Law of the People’s Republic of China (implemented on January 1, 2008);


(19) Guidelines for Establishment of Innovative Transport Industry (Ministry of Communications, implemented on July 24, 2006);

(20) Notices on Regulating the Environmental Protection Acceptance Work on Completion of the Construction Project (No. 26 CHF (2003))

(21) Notices on Further Strengthening the Environmental Protection Work for the Distributed Drinking Water Source (No.132 GJHJBHBGBTHB (2010))

(22) Notices by General office of the people’s government of Sichuan Province on demarcation scheme of urban centralized drinking water source protection area (No. 26 CBH (2010)).

1.3.2 Guidelines and technical specifications

(1) Technical Guidelines for Plan Environmental Impact Assessment General principles (HJ 2.1-2011);

(2) Technical Guidelines for Environmental Impact Assessment-Atmospheric Environment (HJ...
2.2-2008);

(3) Technical Guidelines for Environmental Impact Assessment-Surface Water Environment (HJ/T 2.3-93);

(4) Technical Guidelines for Noise Impact Assessment (HJ 2.4-2009);

(5) Technical Guidelines for Environmental Impact Assessment-Groundwater Environment (HJ 610-2011);

(6) Technical Guidelines for Environmental Impact Assessment-Ecological Impact (HJ 19-2011);

(7) Technical Guidelines for Environmental Risk Assessment on Construction Project (HJ/T 169-2004);

(8) Technical Guidelines for Ecological Environment Status Assessment (trial implementation) (HJ/T 192-2006);

(9) Technical Specification for Comprehensive Control of Soil and Water Conservation (GB/T 16543.1~16453.6-2008);

(10) Technical Specification for Water and Soil Conservation of Development and Construction Project (GB 50433-2008);

(11) Business Manual of World Bank——OP4.01 World Bank Procedure Environmental Assessment;

(12) Business Manual of World Bank——BP4.01 World Bank Procedure Environmental Assessment;


1.3.3 Project related documents


(2) Instructions on Applying for Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans (HFG [2014] No. 107) by Hongya Development and Reform Bureau, Finance Bureau of Hongya, Hongya County Housing and Urban-Rural Construction Bureau

(3) Reply on Executive Standard for Environmental Impact Assessment for Sichuan Small Towns Development Project By World Bank loans of Housing and Urban and Rural Construction Bureau (MSHJH [2015] No. 47) by Meishan Environmental Protection Bureau
(4) Descriptions on Planning And Construction Conditions of “Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans” by Hongya County Housing and Urban-Rural Construction Bureau

(5) Descriptions on Regional Drinking Water Source of “Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans” by Environmental Protection Bureau of Hongya County

1.3.4 Safeguard policy of the World Bank

1. Ten safeguard policies of the World Bank and the compliance analysis

The World Bank has established ten safeguard business policies in social and environmental aspects. The screening is conducted to determine whether the project is involved with the ten policies as per the construction property, project layout and assessment scope determined by the environmental assessment and site investigation. The results are shown in Table 1-1 below:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Safeguard policy</th>
<th>Applicable (Yes/No)</th>
<th>Compliance condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OP/BP4.01 Environmental Assessment</td>
<td>Yes</td>
<td>Class B project; Prepare the complete Environmental Impact Assessment and Environmental Management Plan; as a part of the environmental impact assessment procedure and conduct the two rounds public consultation;</td>
</tr>
<tr>
<td>2</td>
<td>OP/BP4.04 Natural Habitat</td>
<td>No</td>
<td>The policy is not enabled. The land areas and water areas in the project area do not involve any natural habitat.</td>
</tr>
<tr>
<td>3</td>
<td>OP/BP4.36 Forest</td>
<td>No</td>
<td>The policy is not enabled. The project won’t subsidize the significant change or degradation activities involved with the important forests or relevant important natural habitats defined in the policy.</td>
</tr>
<tr>
<td>4</td>
<td>OP/BP4.09 Management for Diseases and Insect Pests</td>
<td>No</td>
<td>The policy is not enabled. The project won't purchase any insecticide nor lead to the increasing of the application amount of the application amount. As per the policy, no activity is required to be adopted.</td>
</tr>
<tr>
<td>5</td>
<td>OP/BP4.11 Physical Cultural Resources</td>
<td>No</td>
<td>The project does not involve the damage of the physical resources.</td>
</tr>
<tr>
<td>6</td>
<td>OP/BP4.37 Dam Safety</td>
<td>No</td>
<td>The policy is not enabled. There is no dam within the project area.</td>
</tr>
<tr>
<td>7</td>
<td>OP/BP4.10 The Native</td>
<td>No</td>
<td>The policy is not enabled. There is no native living in the project area or impact on the native.</td>
</tr>
<tr>
<td>8</td>
<td>OP/BP4.12 Involuntary Migrants</td>
<td>Yes</td>
<td>Applicable to resettlement of inhabitant and prepare the Resettlement Action Plan;</td>
</tr>
<tr>
<td>9</td>
<td>OP/BP7.50 International Waterway Project</td>
<td>No</td>
<td>The policy is not enabled. The project does not involve any international waterway.</td>
</tr>
<tr>
<td>10</td>
<td>OP/BP7.60 Project at the Dispute Region</td>
<td>No</td>
<td>The policy is not enabled. The project doesn’t involve any dispute region.</td>
</tr>
</tbody>
</table>
2. Analysis on the compliance of the project with the provisions in the *EHS Guidelines* of the World Bank and relevant policies

The sewage treatment in the *EHS Guidelines* (general guidelines) and the *Guidelines for Water, Hygienic Environment, Health and Safety*, and the collection and transportation of the wastes in the *Guidelines for Environment, Health and Safety of Toll Road* and the *Guidelines for Environment, Health and Safety of Management Facility for Wastes* of the World Bank Group are also applicable to the project. The relieve measures included in the Environmental Management Plan of the project completely comply with the requirements of the above guidelines (especially the contents related to the construction management). It should be noted that the contents mentioned in the *Guidelines* basically comply with the Chinese laws, regulations, guide rules and construction management rules.

<table>
<thead>
<tr>
<th><strong>EHS Guidelines of the World Bank</strong></th>
<th><strong>Compliance condition of the Environmental Impact Assessment/Environmental Management Plan</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>If the facilities or the project is near the identified ecological sensitive region (such as national park), then the increasing of the pollution level shall be declined as far as possible under the feasible premise. In addition, appropriate relieve measures also include application of the clean fuel or techniques or application of the comprehensive pollution control measures.</td>
<td>There is no ecological sensitive region near the project area.</td>
</tr>
<tr>
<td>Dust or particulate matter (PM) is the most common contaminants among the unorganized emissions. Some operation (such as transportation and open-air storage of the solid materials) and the bare soil surface (including the unpaved road) will release the particulate matter.</td>
<td>The dust control method is adopted during the construction period, e.g. covering or spraying water for dust suppression or improving the water content of the open-air material stacks, and adopting the spraying water for suppression method to control the material transportation on the paved or unpaved road surface.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Guidelines for Water, Hygienic Environment, Health and Safety</strong></th>
<th><strong>Compliance condition of the Environmental Impact Assessment/Environmental Management</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharging industrial wastewater, domestic wastewater, and the wastewater or rainwater produced by public works operation to the public or private waste water treatment system shall comply with the pretreatment and monitoring requirements of the sewage treatment system in which above mentioned water are discharged.</td>
<td>There is no production waste water discharged during the project construction period, and the domestic waste water is treated with the existing sewage treatment facility in the rented house. Part of the production waste water of the water purification plant during the project operational period shall be recycled, the sludge water shall be discharged and the supernatant liquid shall be discharged after...</td>
</tr>
</tbody>
</table>
Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans

1.0 Introduction

<table>
<thead>
<tr>
<th>Rainwater shall be separated from the industrial wastewater and the domestic wastewater to reduce the waste water quantity that can be discharged only after being treated;</th>
<th>The noise prevention and control measures shall be adopted, if at the most sensitive acceptance point, the noise caused by project facility or operation activity is estimated to be exceed relevant noise index.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration treatment, and the domestic wastewater shall be transported to the sewage plant for treatment with sewage vehicles.</td>
<td>Select the equipment with low sound power level; install the vibration isolating device for the mechanical device; Limit the performance time of specific equipment or operation, especially the mobile noise source moving within the community;</td>
</tr>
<tr>
<td>Rainwater and sewage shall be divided at the project area.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1-4 Schedule of the Compliance of the Project Required by the Guidelines for Environment, Health and Safety of Toll Road of the World Bank

<table>
<thead>
<tr>
<th>Guidelines for Environment, Health and Safety of Toll Road</th>
<th>Compliance condition of the Environmental Impact Assessment/Environmental Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under appropriate conditions, the important land and hydrophytic habitat (such as mature old-growth forest, wet land and fish spawning habitat) through selecting appropriate location of the road and the supporting facility and taking advantage of the existing traffic corridor;</td>
<td>The region where the project is located does not belong to the important land and hydrophytic habitat</td>
</tr>
<tr>
<td>Cleaning of the local plant species shall be reduced as far as possible during the construction, and the local plant species shall be replanted at the disturbed areas.</td>
<td>The water and soil conservation scheme is specially prepared, and the appropriate local herbaceous plant shall be planted as per the water and soil conservation scheme measures.</td>
</tr>
<tr>
<td>Conduct the paving for the road in dry weather to prevent the pitch or cement material from loss;</td>
<td>During the construction period, the paving construction is prohibited in strong wind weather, and the construction site shall be determined reasonably;</td>
</tr>
<tr>
<td>The oil water separator shall be used in the treatment work no matter whether it will generate a lot of grease;</td>
<td>The construction machine oily water collector shall be equipped for the construction site to collect the generated oily water. The collected oily water shall be sent to the unit which has the processing capacity for treatment, and direct discharging is prohibited.</td>
</tr>
<tr>
<td>The following measures shall be adopted to avoid the pollution generated from cleaning the pitch equipment, namely, using the vegetable oil instead of diesel oil as the releasing agent and the cleaning agent; prevent the cleaning product and the polluted pitch residual from leakage; conduct the scraping prior to cleaning; and conduct the cleaning activity far away from the surface water or the water discharge facility.</td>
<td>The requirements are specially put forward in the specifications of the Contractor for the “storage of the fuel, oil and dangerous toxic substance”, all fuels at the construction site shall be stored within the rails; the storage area shall be 110% of the fuel storage container. The fuel storage area shall not be close to any water source (namely: within 100m from the water source);</td>
</tr>
<tr>
<td>Adopt the acoustic measure for the surrounding</td>
<td>During the road operational period, the function of the</td>
</tr>
</tbody>
</table>
architectural structure (normally is replacing the windows);
Use the road surface with low road surface/tyre friction noise, such as stone matrix asphalt mixture.

region along the main trunk road, the roadside structure shall be reasonably planned layout and the acoustic design shall be optimized, and the speed limiting management shall be strengthened.

Table 1-5 Schedule of the Compliance of the Project Required by the Guidelines for Environment, Health and Safety of Management Facility for Wastes of the World Bank

<table>
<thead>
<tr>
<th>Compliance condition of the Environmental Impact Assessment/Environmental Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliveried to the waste treatment plant of Hongya County for unified treatment.</td>
</tr>
</tbody>
</table>

Table 1-5 Schedule of the Compliance of the Project Required by the Guidelines for Environment, Health and Safety of Management Facility for Wastes of the World Bank

<table>
<thead>
<tr>
<th>Collection and transportation of the wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourage to use dustbin or garbage bag at the garbage collection point near each family and the buildings; collect the garbage on a regular basis with sufficient frequency to avoid the accumulation of the garbage; cover the garbage collection and transportation vehicles to prevent the garbage from blowing off during driving;</td>
</tr>
<tr>
<td>Collect the garbage on a regular basis;</td>
</tr>
<tr>
<td>Formulate the cleaning plan for the garbage collection vehicles and all garbage collection containers of the enterprise;</td>
</tr>
<tr>
<td>Advocate using garbage bag to prevent the garbage collection equipment from pollution.</td>
</tr>
<tr>
<td>Optimize the garbage collection line to reduce the transportation distance and reduce the total fuel consumption and discharge;</td>
</tr>
<tr>
<td>Set the transfer station for the small size garbage collection vehicle to collect all collected garbage on the large size vehicle to transport the garbage to the waste treatment plant;</td>
</tr>
</tbody>
</table>

3. Compliance analysis for the domestic laws and regulations.

The preparation of the environmental documents is conducted completely as per the above mentioned laws and regulations and guide rules. The compliance summary for the domestic regulations related to the project is shown in Table 1-6 below.

Table 1-6 Schedule for the Compliance Condition of the Chinese Laws and Regulations

<table>
<thead>
<tr>
<th>Chinese laws and regulations</th>
<th>Project compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Impact Assessment</td>
<td>The complete Environmental Assessment Report shall be prepared by the certified Environmental Impact Assessment Consultant and the Project Unit, and the two rounds public participation shall be conducted.</td>
</tr>
<tr>
<td>Notices on strengthening the environmental assessment management for the construction</td>
<td>The Environmental Assessment Report and the Environmental Management Plan shall comply with the safeguard policy of the World Bank.</td>
</tr>
</tbody>
</table>
1.0 Introduction

<table>
<thead>
<tr>
<th>Chinese laws and regulations</th>
<th>Project compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>project financed by international financing organization</td>
<td>Relevant land use planning requirements in the <em>Overall Planning for Hongya County</em> and <em>Overall Planning for Liujiang Town</em>.</td>
</tr>
<tr>
<td><em>The Law of Land Administration of the People’s Republic of China</em></td>
<td>Production waste water shall be recycled and the domestic wastewater shall be treated appropriately.</td>
</tr>
<tr>
<td><em>Water Pollution Prevention and Control Law</em></td>
<td>☐ Prepare the water and soil conservation scheme, and report to the Sichuan Water Supplies Bureau for review and approval, and adopt the water and soil erosion prevention and control measures as per the approved water and soil conservation scheme.</td>
</tr>
<tr>
<td></td>
<td>☐ The sand, stone, soil, etc., discarded in the construction activity shall be stacked at the spoil ground specified in the water and soil conservation scheme, and the measures shall be adopted to ensure there is no new danger.</td>
</tr>
<tr>
<td></td>
<td>☐ The water and soil erosion monitoring scheme is prepared and the monitoring condition is reported to the Meishan Water Supplies Bureau on a regular basis.</td>
</tr>
<tr>
<td><em>Soil and Water Conservation Law</em></td>
<td>There is no culture relic protection site within the scope of the project for now. During the construction, the site for the cultural relics found by any unit or individuals shall be protected and shall be immediately reported to the local cultural relic administrative department.</td>
</tr>
<tr>
<td><em>Law for the Preservation of Antiques</em></td>
<td>Promote the wild animal conservation law and improve the protection awareness of the construction personnel. The construction personnel must comply with the <em>Law of the People’s Republic of China on the Protection of Wild Life</em>, and hunting the wild animals near the construction area and its surroundings is strictly prohibited.</td>
</tr>
</tbody>
</table>

1.4 Assessment level and assessment scope

1.4.1 Assessment level

1. Ecological environment

There are no rare and endangered animals and plants within the influence area of the two sub-projects of the project; the biological diversity shall not be reduced and the land status shall not be changed after the engineering construction; according to the regulations in the Technical Guideline for Environmental Impact Assessment-Ecological Impact (HJ19-2011), the evaluation level is determined as level three.

2. Acoustic environment

Both of the sub-projects are located within the constructed areas of the city; the ambient noise level of the road (urban branch) proposed during the operation period of Liujiang sub-projects and the waterway transformation of Hongchuan sub-projects can be certainly increased; the influence that the noise of the two sub-projects give to the environment is mainly in the construction period. Therefore, according to the regulations in Technical Guidelines for Noise Impact Assessment (HJ2.4-2009), it is determined that the level of the environmental impact assessment of the project is level two.
3. Surface water environment

A little construction wastewater and domestic sewage will be discharged during the construction of the two sub-projects of the project; the wastewater discharged by the roads and bridges during the operation period of Liujiang sub-project comes from the road runoff of the rainfall and the wastewater produced in the road surface cleaning when motor-vehicle accident happens; the complexity level of the water quality of the road runoff is simple, which mainly contains SS, COD, petroleum and other pollutants. The production wastewater of water supply works is recycled; the domestic sewage is used for the agricultural irrigation, which cannot be discharged.

Therefore, according to the regulations in Technical Guidelines for Environmental Impact Assessment Surface Water Environment (HJ/T2.3-93), the level of Water Environmental Impact Assessment is level three.

4. Atmospheric Environment

After the completion of the project, the new roads, bridge engineering and the automobile exhaust of the ecological parking lot of Liujiang Town Sub-project will have influence on the regional atmospheric environment. According to Guidelines for Environmental Impact Assessment Atmospheric Environment (HJ2.2-2008), the roads constructed in Liujiang sub-project are urban secondary main roads and urban branches; the waste gas discharged during the construction period and the operation period of the project is mainly the waste gas of the automobile fuel, the maximum ground mass concentration of its main pollutants, like CO and NO\textsubscript{2}, accounts for less than 10\% of the standard concentration; according to the guidelines, the level of the atmospheric environment impact assessment is level three.

5. Groundwater environment

According to HJ610-2011, the project belongs to the Class II project; the sensitivity level of the groundwater environment is a little bit sensitive-insensitive in area where the project locates. If the appropriate dewatering measures are adopted during the excavation of foundation pit, no environmental hydrogeology problem will be caused. Therefore, according to the requirements in Technical Guidelines for Environmental Impact Assessment Groundwater Environment (HJ610-2011), the level of the groundwater environmental impact assessment is level three.

Therefore, the levels of environmental impact assessment for the main subjects are shown in Table 1-7 below.


<table>
<thead>
<tr>
<th>Assessment subject</th>
<th>Assessment level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological environment</td>
<td>Level three</td>
</tr>
<tr>
<td>Acoustic environment</td>
<td>Level two</td>
</tr>
<tr>
<td>Surface water</td>
<td>Level three</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Level three</td>
</tr>
<tr>
<td>Ambient air</td>
<td>Level three</td>
</tr>
</tbody>
</table>

1.4.2 Assessment scope

According to the assessment level of the project, the assessment scopes of the ecological, acoustic, water, atmospheric and groundwater environment are determined.

1. **Assessment scope of social environment**

The influence area of the project is the direct influence area of the project, the investigation and analysis of the social environment is expanded to the direct influence area. The main social influence areas of the project are Hongchuan Town of Hongchuan sub-project and Liuba District (Hongxing Village), Lianghe Village and Yang Village of Liujiang sub-project.

2. **Assessment scope of the ecological environment**

The scopes of the ecological environmental impact assessment are the scope within 200m on the both sides of the proposed roads and the bridge center line of Liujiang sub-project, the riverway engineering of Hongchuan sub-project, the construction area of sewage pipes and the temporary ground of both sub-projects.

3. **Assessment scope of acoustic environment**

The scopes of the acoustic environmental impact assessment are the scope within 200m on the both sides of the proposed roads and the bridge center line of Liujiang sub-project, the riverway engineering of Hongchuan sub-project and the scope within 200m of the construction area of sewage pipes.

4. **Assessment scope of water environment**

The assessment scope of the water environment of the project is the surface water body involved in the project area-Huaxi River, Yangcun River and Liujiang River of Liujiang sub-project and the moat of Hongchuan sub-project.

5. **Assessment scope of atmospheric environment**

The scopes of atmospheric environmental impact assessment are the scope within 200m on the both sides of the proposed roads and the bridge center line of Liujiang sub-project, the riverway engineering of Hongchuan sub-project and the scope within 500m around the construction area of sewage pipes.
6. Assessment scope of groundwater environment

The scopes of groundwater environmental impact assessment are the scope within 200m on the both sides of the proposed roads and the bridge center line of Liujiang sub-project, the riverway engineering of Hongchuan sub-project and the scope within 500m around the construction area of sewage pipes.

1.5 Assessment standard

1.5.1 Environmental quality standard

According to The Official Reply to The Executive Standard of the Environmental Impact Assessment for The Sichuan Small Towns Development Project By World Bank loans of Hongya County Housing and Urban-Rural Construction Bureau, the executive standards for the project assessment are as following:

1. Acoustic environment

The new roads of Liujiang sub-project refer to the construction of urban secondary main roads; according to the division situations of the acoustic function areas of the areas of both sub-projects, the Class 2 or Class 4a standard in Environmental Quality Standard for Noise shall be executed in the project areas; for the standard values of each class, see Table 1-8 below.

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Concentration standard</th>
<th>Unit of concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM$_{10}$</td>
<td>0.10/day 0.15/daily</td>
<td>mg/m$^3$ (standard state)</td>
</tr>
<tr>
<td>NO$_2$</td>
<td>0.04/annual 0.08/daily</td>
<td>/</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>0.06/annual 0.15/daily</td>
<td>0.50</td>
</tr>
</tbody>
</table>

2. Ambient air

Class 2 in Ambient Air Quality Standard (GB3095-2012) is executed in the project areas; for the specific items and standard limits, see Table 1-9 below.

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Concentration standard</th>
<th>Unit of concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual mean Daily mean One-hour mean</td>
<td></td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>0.10 0.15</td>
<td>/</td>
</tr>
<tr>
<td>NO$_2$</td>
<td>0.04 0.08</td>
<td>0.20</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>0.06 0.15</td>
<td>0.50</td>
</tr>
</tbody>
</table>

3. Water environment

The Class III standard in Environmental Quality Standards for Surface Water (GB3838-2002) is executed for the surface water involved in the project; for the specific items and standard limits, see Table 1-10 below.
Table 1-10 Environmental quality standard value for surface water (unit: mg/l)

<table>
<thead>
<tr>
<th>S/N</th>
<th>Items</th>
<th>Class Ⅲ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH (dimensionless)</td>
<td>6-9</td>
</tr>
<tr>
<td>2</td>
<td>Chemical oxygen demand (COD)</td>
<td>≤20</td>
</tr>
<tr>
<td>3</td>
<td>BOD₅</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Ammonia nitrogen</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>DO</td>
<td>5</td>
</tr>
</tbody>
</table>

The Class Ⅲ standard in Quality Standard for Ground Water (GB/T14848-93) is executed for the ground water of the project. For the standard value, see Table 1-11 below.

Table 1-11 Quality Standard for Ground Water (GB/T14848-93) Unit: mg/L

<table>
<thead>
<tr>
<th>Index</th>
<th>Class Ⅲ water area standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH(dimensionless)</td>
<td>6.5~8.5</td>
</tr>
<tr>
<td>Total hardness</td>
<td>≤450</td>
</tr>
<tr>
<td>Index of permanganate</td>
<td>≤3.0</td>
</tr>
<tr>
<td>NH₃-N</td>
<td>≤0.2</td>
</tr>
<tr>
<td>Volatile phenols</td>
<td>≤0.002</td>
</tr>
</tbody>
</table>

1.5.2 Discharge standard of pollutants

1. Noise

Each noise limit in Emission Standard of Environment Noise for Boundary of Construction (GB12523-2011) is adopted for the construction noise. For the detailed standard limit, see Table 1-12 below.

Table 1-12 Noise Limit for Construction Boundary (GB12523-2011) Unit: dB (A)

<table>
<thead>
<tr>
<th>Noise limit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime</td>
<td>70</td>
</tr>
<tr>
<td>Nighttime</td>
<td>55</td>
</tr>
</tbody>
</table>

The Class 2 standard in Emission Standard for Industrial Enterprises Noise at Boundary is adopted for the boundary noise. For the detailed standard limit, see Table 1-13 below.

Table 1-13 Emission Standard for Industrial Enterprises Noise at Boundary (GB12348-2008) Unit: dB (A)

<table>
<thead>
<tr>
<th>Class of standard</th>
<th>Standard value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime</td>
</tr>
<tr>
<td>Class 2</td>
<td>60</td>
</tr>
</tbody>
</table>

2. Wastewater

For the drainage of the project which can be disposed in the sewage disposal plant, the Class 3 standard in Integrated Wastewater Discharge Standard (GB8978-96); for the drainage of the project which cannot be disposed in the sewage disposal plant, the Class 1 standard in Integrated Wastewater Discharge Standard (GB8978-96); for the specific standard value, see Table 1-14.
Table 1-14 Standard Limit for Sewage Discharge (Unit: mg/L)

<table>
<thead>
<tr>
<th>S/N</th>
<th>Pollutants</th>
<th>Scope of application</th>
<th>Class 1 standard</th>
<th>Class 3 standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>All pollutant discharging unit</td>
<td>6~9</td>
<td>6~9</td>
</tr>
<tr>
<td>2</td>
<td>Suspended solids (SS)</td>
<td>Other pollutant discharging unit</td>
<td>70</td>
<td>400</td>
</tr>
<tr>
<td>3</td>
<td>Chemical oxygen demand (COD&lt;sub&gt;c&lt;/sub&gt;)</td>
<td>Other pollutant discharging unit</td>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>4</td>
<td>Petroleum</td>
<td>All pollutant discharging unit</td>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

3. Waste gas

The Class 2 of the maximum allowed emission concentration and the maximum allowed emission rate in Integrated Emission Standard of Air Pollutants (GB16297-1996) shall be adopted for the waste gas during construction period and the automobile exhaust during operation period; see Table 1-15 below.

Table 1-15 Class 2 Standard in Integrated Emission Standard of Air Pollutants

<table>
<thead>
<tr>
<th>Pollutants</th>
<th>Emission concentration</th>
<th>Emission rate</th>
<th>Concentration limit for unorganized emission monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate matter</td>
<td>120mg/m³</td>
<td>3.5kg/h(15m)</td>
<td>1.0mg/m³</td>
</tr>
<tr>
<td>Nitric oxide</td>
<td>240mg/m³</td>
<td>0.77kg/h(15m)</td>
<td>0.12mg/m³</td>
</tr>
<tr>
<td>Asphalt fume</td>
<td>75mg/m³</td>
<td>0.18kg/h(15m)</td>
<td>No obvious unorganized emission is allowed for the production equipment</td>
</tr>
</tbody>
</table>

1.6 Time for assessment and prediction

The time for project assessment mainly contains its construction period and operation period. The construction period is from January 2016 to December 2016, 12 month in total.

1.7 Assessment method

The assessment principle of Combine Points with Lines, “focus on points, emphasize the key point and feed back to the whole line”, is adopted for the assessment; methods like investigation, monitoring, calculation and analysis are adopted for current situation assessment; methods like model calculation and analogy analysis are adopted for forecast assessment. The forecast assessment for noise is carried out by the methods of model calculation and analogy analysis; the forecast assessment for atmosphere is carried out by the method of analogy analysis; methods of estimation and analogy are adopted for the water and soil loss in ecological environment;
investment and analysis method is adopted for social economy and traffic environment.

1.8 Assessment content and key points of assessment

1.8.1 Assessment content

The main contents of the assessment include: ecological environmental impact assessment, acoustic environmental impact assessment, social environmental impact assessment. In addition, the surface water environmental impact analysis, ambient air impact analysis, public consultation, plan of environment management and monitoring and environmental impact economic cost-benefit analysis will also be discussed in the report.

1.8.2 Key points of assessment

According to the features of the project, the key points for the environmental impact assessment include: the ecological environmental impact during construction period, construction dust and noise environmental impact; during operation period, the environmental impact of the traffic noise of roads and bridges, noise of water supply (purification plant) engineering equipment, industrial and domestic wastewater and solid.

1.9 Conformance to industrial policy and planning

1.9.1 Conformance to industrial policy and planning

According to the Catalogue for Guiding Industry Restructuring (2011 Version) (2013 Amendment) of the No. 9 of National Development and Reform Commission, the project belongs to the Clause 4 “Construction of Urban Roads and Intelligent Traffic System”, Clause 11 “Urban Garden Greening and Ecological Housing Area Construction” and Clause 23 “Urban Public Traffic Construction” of the No. 22 Urban Infrastructure and Real Estate in Class 1 Encouraged; the project also belongs to Clause 7 “Desilting and Dredging Engineering of Rivers, Lakes and Reservoirs” of the No. 2 water conservancy. Therefore, the project belongs to the project encouraged by the county, which conforms to the national current industrial policy and conforms to the strategy of sustainable development.

1.9.2 Conformance to related planning and design

1. Analysis of the conformance with the overall planning of Hongya County

According to the Overall Planning of Hongya County (2003-2020), it can be known that: the objects of the overall planning of Hongya County include: (1) the perfect and high-efficient urban infrastructures shall be constructed, including water supply and drainage, power supply, postal service, telecommunication, fire protection, environment sanitation and the clean energy like fuel gas and electric power; (2) protect and reconstruct the urban ecological environment and green space system. Hongchuan sub-project locates in the city of Hongya County, mainly including
riverway engineering and sewage pipe engineering; the riverway engineering is mainly carried out for the riverway treatment of the city moat and the implementation of the bank landscape engineering, which conforms to the requirements of the construction of urban ecological environment; the sewage pipe engineering is the construction along the river, whose pipeline layout conforms to the planning requirements and which conforms to the objects of perfecting the urban infrastructures.

In conclusion, the implementation of Hongchuan sub-project conforms to the overall planning of Hongya County.

2. Analysis of the conformance with the overall planning of Liujiang Town

According to the Overall Planning of Liujiang Town, it can be known that: the development objects of Liujiang Town planning: perfect the city and town infrastructure and public service facility, which can accommodate the requirements of economic and social development of city and town, and which can have strong collecting and radiation effect on the town and the areas around; fully enhance the infrastructure construction level in the town , improve the transportation level in the town, increase thee input intensity of water supply and drainage and environmental protection facilities and provide support for the overall well-off construction. The Liujiang sub-project is the construction project of infrastructure, which conforms to the development requirements of the overall planning of Liujiang Town.

1.10 External environment relations and the environmental protection objects

1.10.1 External environment relations

The Hongchuan sub-projects of the project are riverway engineering and sewage pipe engineering, the project locates in the confluence segment of the moat in the south and north to the collection segment of Qingyi River; the sewage interception pipes are paved along the line of river regulation works; partial rural residents and a few enterprises are mainly distributed in the both sides of the riverway; there are mostly beachland and wasteland in the both sides of the riverway, whose external environment is quite simple. Specifically, Liujie residential area, wood-working factory, New Hope Food Products Factory and Hongya steel mill (closed) are distributed on the left of the riverway of the moat. The beachland distributed on the right of the moat is wasteland, which is construction land.

A lot of projects are contained in the Liujiang sub-project. The roads engineering locates in Liuba District of Liujiang Town; the construction area of the project are mainly construction land; there is mainly residential area and shops around the roads to be reconstructed; The central health center of Liujiang Town and nursing home are the important sensitive spots. A few scattered
farmers are distributed on the both side of bridge engineering, whose external environment is quite simple. The urban rainwater garden locates in Liuba District of Liujiang Town, around which is mainly construction land. The purification plant is planned to be built in Yang Village of Liujiang Town, whose external environment is quite simple, there are only 3 families within 200m; the water-transmission line is paved along the main road of Liujiang Town, residential area and shops are distributed on the both sides of the road. The ecological parking lot locates in sloping fields, some scattered peasant households are distributed around.

In conclusion, the external environment of project area is simple without special environment sensitive areas.

1.10.2 Environmental protection objects

According to the environment function in regional planning and the influence scope which may be caused after completion of the project, the environmental protection objects are determined.

1. Social environmental protection object

The residents and concentrated residential areas influenced by land acquisition and demolition along the project

2. Ecological environmental protection object

The main ecological environmental protection object of the project is the land resource and the natural vegetation and landscape along the line, see Table 1-16 below.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Environmental elements</th>
<th>Environmental protection objects</th>
<th>Locations</th>
<th>Environment characteristic</th>
<th>Environmental problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ecological environment</td>
<td>Vegetable, water and soil</td>
<td>Hongchuan Town sub-project areas</td>
<td>Mainly beachland</td>
<td>Land occupation, deterioration of soil and vegetable</td>
</tr>
<tr>
<td>2</td>
<td>Ecological environment</td>
<td>Vegetable, water and soil</td>
<td>Liujiang Town sub-project areas</td>
<td>Mainly cultivated land</td>
<td>Land occupation, deterioration of soil and vegetable</td>
</tr>
</tbody>
</table>

3. Water environmental protection objects

The main water body within the project area is mainly the water body involved in the modification works of Hongchuan Town sub-project-the moat of Hongchuan Town, the river is affected by the bridge and water supply works of Liujiang Town Sub-project-Huaxi River, Yangcun River and Yangliu River. Therefore, for the specific water environmental protection objects of the project; see Table 1-17 below: 
Table 1-17-1 Surface Water Environmental Protection Objects

<table>
<thead>
<tr>
<th>S/N</th>
<th>Environmental protection objects</th>
<th>Locations</th>
<th>Environment characteristic</th>
<th>Environmental problem</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Surface water environment</td>
<td>Hongchuan moat</td>
<td>Water body involved in the riverway modification works of Hongchuan</td>
<td>Function of water body: agricultural irrigation, flood discharge</td>
<td>Hongchuan Town</td>
</tr>
<tr>
<td>2</td>
<td>Huaxi River</td>
<td></td>
<td>Water body involved in the bridge engineering</td>
<td>Function of water body: agricultural irrigation, flood discharge</td>
<td>Liujiang Town</td>
</tr>
<tr>
<td>3</td>
<td>Yangcun River</td>
<td></td>
<td>Water body involved in the water supply works</td>
<td>Function of water body: agricultural irrigation, flood discharge and drinking</td>
<td>Liujiang Town</td>
</tr>
<tr>
<td>4</td>
<td>Yangliu River</td>
<td></td>
<td>Water body involved in the bridge engineering</td>
<td>Function of water body: agricultural irrigation, flood discharge</td>
<td>Liujiang Town</td>
</tr>
</tbody>
</table>

Table 1-17-2 Groundwater Environmental Protection Objects

<table>
<thead>
<tr>
<th>S/N</th>
<th>Environmental protection objects</th>
<th>Locations</th>
<th>Environment characteristic</th>
<th>Environmental problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Groundwater environment</td>
<td>Groundwater in project area</td>
<td>Within 200m around the construction area of the project</td>
<td>No concentrated source of drinking water of groundwater</td>
</tr>
</tbody>
</table>

4. Ambient air and acoustic environmental protection objects

The ambient air and acoustic environmental protection objects of the project are determined according to the engineering features and the distribution of the sensitive spots of the project area.

The project engineering mainly refers to two sub-projects, Hongchuan Town sub-project and Liujiang Town Sub-project. Hongchuan Town sub-project is riverway engineering and is paved along the sewage pipes of the river, which is mainly linear project; the main sensitive spots of the engineering are 3 residential areas. Liujiang Town sub-project mainly refers to the central health center of Liujiang Town and nursing home as well as 3 main village-level residential areas.

In conclusion, the distribution of the ambient air and acoustic environmental protection objects determined in the project is as Table 1-18 below.

Table 1-18-1 Ambient Air and Acoustic Environmental Protection Objects of the Project (Hongchuan Town)

<table>
<thead>
<tr>
<th>Engineering</th>
<th>S/N</th>
<th>Name</th>
<th>The position relation and distance (m) with each</th>
<th>Category and class of protection objects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.0 Introduction

<table>
<thead>
<tr>
<th>Riverway engineering</th>
<th>S/N</th>
<th>Name</th>
<th>The position relation and distance (m) with each engineering</th>
<th>Acoustic environment</th>
<th>Atmospheric Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Liujie residential area</td>
<td>Riverway improvement, (water flow direction) 30m on the left side</td>
<td>Environmental Quality Standard for Noise (GB 3096-2008) Class 2 functional area, Class 2 standard</td>
<td>Ambient Air Quality Standard (GB3095-1996) Class 2 area, Class 2 standard</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Hongchuan Town Linchang Community</td>
<td>Riverway improvement, (water flow direction) 20m on the right side</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Fengheba residential area</td>
<td>Riverway improvement, (water flow direction) 100m on the right side</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewage pipe engineering</td>
<td>1</td>
<td>Liujie residential area</td>
<td>Sewage pipe are paved on the both sides of the drainage basin</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1-18-2 Ambient Air and Acoustic Environmental Protection Objects of the Project (Liujiang Town)

<table>
<thead>
<tr>
<th>Engineer ing</th>
<th>S/N</th>
<th>Name</th>
<th>The position relation and distance (m) with each engineering</th>
<th>Category and class of protection objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road engineering</td>
<td>1</td>
<td>Central health center of Liujiang Town</td>
<td>A1 road (motor road) 16m (from the red line) on the north side</td>
<td>Environmental Quality Standard for Noise (GB 3096-2008) Class 2 functional area, Class 2 standard</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Nursing home of Liujiang Town</td>
<td>C1 road (walking road) 10m (from the red line) in the east</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Residents of Liuba District (Hongxin Village)</td>
<td>A1 road (motor road) 26m (from the red line) on the south side</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Residents of Shuanghe Village</td>
<td>A2 north road (motor road) 21m (from the red line) on the east side</td>
<td></td>
</tr>
<tr>
<td>Water supply works</td>
<td>5</td>
<td>Residents of Liuba District (Hongxin Village)</td>
<td>On both sides of the water supply network construction site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Residents of Yang Village</td>
<td>20m on the south side of water supply plant</td>
<td></td>
</tr>
<tr>
<td>Bridge engineering</td>
<td>7</td>
<td>Residents of Shuanghe Village</td>
<td>Close to the north side of the motor bridge</td>
<td></td>
</tr>
<tr>
<td>Ecologica l parking lot engineering</td>
<td>8</td>
<td>Residents of Shuanghe Village</td>
<td>Close to the south side of ecological parking lot</td>
<td></td>
</tr>
</tbody>
</table>
2.0 Project Overview

2.1 Project name, project location and construction type

**Project name:** Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans

**Location of construction site:** Hongchuan Town and Liujiang Town, Hongya County

**Project owner:** Hongya County Housing and Urban-Rural Construction Bureau

**Construction type:** new construction

**Project investment:** the total investment of this Project reaches RMB 118,073,200, including USD 14 million loaned from World Bank. The left is invested by the government.

2.2 Construction project composition

This Project mainly includes the Hongchuan Town Subproject, such as the river channel works and the sewage pipe works, as well as the Liujiang Town Subproject, such as the road works, the bridge works, the urban rainwater garden works, the water purification plant works and supporting pipeline works, the digital urban works and the ecological parking lot works and the like. In addition, the supporting and auxiliary facilities are also included. The details of project compositions are as shown in Table 2-1.

### Table 2-1 Project Composition

<table>
<thead>
<tr>
<th>Item Composition</th>
<th>Construction contents and scale</th>
<th>Major environmental impact</th>
<th>Construction period</th>
<th>Operation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hongchuan Town Subproject</td>
<td>River channel works: river dredging 2.2km, desilting 106,800 m³; riverine wetland governance 6.37801ha (about 95.62 mu); new river bank construction 2.2km, and river bank repair and renovation 1.8km.</td>
<td>Land occupation, Construction waste water, Construction dust, Construction waste</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>Liujiang Town Subproject</td>
<td>Road works: new road construction 1.39km, and road reconstruction 0.97km. The road width is 8-12m as per the planning. The A1 road is as long as 652.07m; the North A2 road is as long as 333.324m; the C1 road is as long as 448.265m; and the C2 road is as long as 926.796m.</td>
<td>Traffic noise and waste gas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans

#### 2.0 Project Overview

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water supply works</td>
<td>1 new water purification plant covering an area of 7.5mu, with short term (2020) capacity of 2500m³/d and long term (2030) capacity of 4500m³/d; and the new water transportation pipeline 12km.</td>
</tr>
<tr>
<td>Waste water</td>
<td></td>
</tr>
<tr>
<td>Sewage pipe works</td>
<td>sewage pipe laying 2.35km.</td>
</tr>
<tr>
<td>### Auxiliary works</td>
<td></td>
</tr>
<tr>
<td>Urban rainwater garden works</td>
<td>new public green land 67312.17m² (about 100 mu).</td>
</tr>
<tr>
<td>Road facilities</td>
<td>traffic signs, traffic marks, signal facilities, separation facilities, protective guard, crash barrier and the like</td>
</tr>
<tr>
<td>Digital urban works</td>
<td>geological framework data and other facilities, mainly including the urban digital equipment and software</td>
</tr>
<tr>
<td>Ecological parking lot</td>
<td>construct a single-layer ecological parking lot with a floor area of 7954m² and 237 vehicular parking places (228 for private cars and 9 for buses) and 60 bicycle parking places (for public rental).</td>
</tr>
<tr>
<td>Traffic noise and waste gas</td>
<td></td>
</tr>
</tbody>
</table>
| Construction site, temporary stock yard of construction soil and the like: 1 temporary sludge stock yard is set up for the Hongchuan Town Subproject | Traffic noise and waste gas |}

### 2.3 Overview of main works

#### 2.3.1 Main works of the project

For the river channel works and sewage pipe works of Hongchuan Town Subject as well as the road works, bridge works, urban rainwater works, water purification plant and pipe network of Liujiang Town Subject, refer to Feasibility Study Report on Hongya County Restructuring Component of Sichuan Small Towns Development Project prepared by CREEC.

Water purification plant and pipe network involve water resource feasibility, which will be
briefly described in this section.

The water resource feasibility study report for the water purification plant of Liujiang Town Subproject of the Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans was completed by Water Conservancy and Power Construction, Survey & Design Institute, Yibin, Sichuan in June 2015 and the reply from Hongya County Water Authority was obtained. According to the report, the water intake and use is reasonable, the water quantity is ensured and water source is reliable for the project.

The water resource feasibility report and the reply are as shown in Annex 4 in details.

2.3.2 Temporary works

1. Construction site and stock yard

(1) Hongchuan Town

For the pipe works of the Hongchuan Town Subject of this Project, a construction stock yard will be provided for the construction of the pipeline works in this Project and the land will be temporarily occupied. The construction stock yard covers the floor space of about 1.88hm², which is located on the dry land. No residential areas are located within 200m of the stock yard.

(2) Liujiang Town

The sands and stones required by the road and bridge works in Liujiang Town shall be purchased from the outside source. No stock yard is provided and the concrete blending station is provided in the construction yard. The asphalt for this Project is purchased from the commercial asphalt blending station. As a result, no asphalt blending station is provided for the Liujiang Town project. The works of Liujiang Town cover a large land occupation area. The construction site and the stock yard will be seated in the permanent land occupation range of this Project and temporary land occupation is required.

2. Construction road

(1) Hongchuan Town

The construction road shall be built for the implementation of sewage pipe works in Hongchuan Town. The construction road is as long as about 1.5km and as wide as about 2-3m. Once the works are completed, the temporarily-occupied land in this section shall be recovered.

(2) Liujiang Town

The permanent road system can be rebuilt at first when the Liujiang Town Subproject is implemented. The other constructions can be conducted with the planned and designed road system. In this way, the transportation requirements can be meet. The construction road is not added in this Project and the materials, the topsoil and the sludge are transferred via the permanent road in the project area.
3. Temporary spoil area and temporary sludge stock yard

No temporary spoil area is provided in this Project. One temporary sludge stock yard is provided in the subproject of Hongchuan Town, which is located at one side of the landscape construction area and covers an area of 2.06hm². The occupied land is a wasteland. No residential areas are located within 200m of the spoil area. The details of the geological location are as shown in Figure 3-1. The sludge works are implemented in stages. The sludge is mainly filled in the woven bags and manually transferred, to avoid the leakage and the large-scale scatter during the vehicle transportation.

4. Construction camp

No centralized construction camps are provided in this Project. The accommodation is mainly solved by renting the houses of local citizens. In this way, the influence caused by temporary land occupation can be reduced and the domestic sewage and the domestic garbage can be treated via the existing treatment facilities and further the environmental impact is reduced. Meanwhile, the income of local citizen can be increased. As a result, this mode is believed to be rational by the environmental evaluation.

5. Construction power supply

The power line is available in the area where the line passes through. The construction site and other locations shall be determined according to the stages of work and the situation of the construction team. The power supply shall be provided by connecting to the nearby transmission grid.

6. Construction water

The construction water can be taken from the nearby water resource. The drinking water shall be supplied from the existing local facilities.

2.3.3 Earthwork balance

According to the requirements for soil and water conservation laws, regulations and specifications, the area of soil and water conservation facility, damaged by the subproject of Hongchuan Town, reaches 21.63 hm², after the statistics for area disturbed by the works construction and land occupation, the water losses and soil erosion prediction and the site investigation. The total earthwork excavation volume (natural volume) reaches 46,700 m³ (equivalent to 62,100 m³ loose measure) in the construction period of this Project. The total fill volume is 73,400 m³ (equivalent to 97,600 m³). In addition, the natural sludge volume is 126,800 m³ (equivalent to 111,600 m³ dry sludge). 29,000 m³ sludges are used as the backfilled planting soil for wetland and landscape and the landscape shaping in the project area, while the residual 97,800 m³ sludges are used as the landscape, greening and planting soil for municipal road
construction in Hongya County. No permanently-abandoned earthwork is produced and no spoil area is provided in this Project. The construction organization shall well finish the water and soil conversation work for the water losses and soil erosion caused by the transportation of dry sludge.

The soil and water conservation facility covers an area of 10.51 hm² in the subproject of Liujiang Town. The total excavated earthwork volume (natural earthwork volume) is 79,100 m³ (equivalent to 105,200 m³ loose measure) in the construction period of this Project. The total fill volume reaches 79,100 m³ (equivalent to 105,200 m³ loose measure). No permanently-abandoned earthwork is produced and no spoil area is provided in this Project, to avoid the new water loss and soil erosion caused by the transportation of excavated earthwork.

The earthwork balance table of two subprojects is as shown in Table 2-7 and Table 2-8.

Table 2-7 Project Earth and Rock Balance Table (Hongchuan Town) (mg/L)

<table>
<thead>
<tr>
<th>Position</th>
<th>Zone</th>
<th>Excavation of earthwork and stonework</th>
<th>Backfill of earthwork and stonework</th>
<th>Import</th>
<th>Export</th>
<th>Abandon</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Excavate</td>
<td>Desilt</td>
<td>Strip topsoil</td>
<td>Fill</td>
<td>Backfill sludge after drying</td>
<td>Use topsoil</td>
</tr>
<tr>
<td></td>
<td>Embankment building area</td>
<td></td>
<td>1.26</td>
<td>1.03</td>
<td>3.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road and cliff-side plank road</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landscape and green area</td>
<td></td>
<td>1.03</td>
<td>2.90</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Temporary sludge drying area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sewage pipe area</td>
<td></td>
<td>3.41</td>
<td>0.45</td>
<td>2.75</td>
<td>0.45</td>
<td></td>
</tr>
</tbody>
</table>
### Table 2-8 Project Earth and Rock Balance Table (Liujiang Town) (mg/L)

<table>
<thead>
<tr>
<th>Position</th>
<th>Zone</th>
<th>Excavation of earthwork and stonework</th>
<th>Backfill of earthwork and stonework</th>
<th>Import</th>
<th>Export</th>
<th>Abandon</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Excavation</td>
<td>Strip topsoil</td>
<td>Fill</td>
<td>Use topsoil</td>
<td>Quantity</td>
<td>Source</td>
</tr>
<tr>
<td>Project construction area</td>
<td>Construction and structure area</td>
<td>0.8</td>
<td>0.1</td>
<td>0.89</td>
<td>0.19</td>
<td>Zone 3</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>Road, bridge and square area</td>
<td>2.89</td>
<td>0.12</td>
<td>2.89</td>
<td>0.12</td>
<td>Zone 3</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Water area, landscape and green area</td>
<td>4.22</td>
<td>1.44</td>
<td>4.13</td>
<td>1.66</td>
<td>Zone 1 Zone 2</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>7.91</td>
<td>1.66</td>
<td>7.91</td>
<td>1.66</td>
<td>0.43</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2-2 Earth and Rock Balance Diagram of Hongchuan Town
Figure 2-3 Earth and Rock Balance Diagram of Liujiang Town

2.3.9 Project land occupation, displacement and resettlement

1. Project land occupation

(1) Hongchuan Town Subproject

Parts of the construction site are located in the permanent land occupation range of the Project, while the others are located in the temporary land occupation range. The surrounding
traffic conditions are very convenient. As a result, the construction area of this Project includes the river embankment, the road and access, the greening land, the water area and the temporary soil and rock stock yard. The total area of occupied area is 21.63 hm², including 9.01hm² permanent land occupation and 12.62 hm² temporary land occupation.

(2) Liujiang Town Subproject

The construction site is completely located in the permanently-occupied land range of this Project. The surrounding traffic conditions are very convenient. 1.31 hm² new land is occupied, which is the plowland. The construction area of this Project includes the construction, structure, road, bridge, greening land and water land. The total area is 10.51 hm².

<table>
<thead>
<tr>
<th>Zone</th>
<th>Prevention area</th>
<th>Area (hm²)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hongchuan Town</td>
<td>Embankment building area</td>
<td>0.44</td>
<td>Permanent land occupation</td>
</tr>
<tr>
<td></td>
<td>Road and cliff-side plank road</td>
<td>1.64</td>
<td>Permanent land occupation</td>
</tr>
<tr>
<td></td>
<td>Landscape and green area</td>
<td>6.83</td>
<td>Permanent land occupation</td>
</tr>
<tr>
<td></td>
<td>Water area</td>
<td>6.85</td>
<td>Temporary land occupation</td>
</tr>
<tr>
<td></td>
<td>Temporary sludge drying area</td>
<td>2.06</td>
<td>Temporary land occupation</td>
</tr>
<tr>
<td></td>
<td>Main pipe area</td>
<td>1.49</td>
<td>Permanent and temporary land occupation</td>
</tr>
<tr>
<td></td>
<td>Construction road area</td>
<td>0.44</td>
<td>Temporary land occupation</td>
</tr>
<tr>
<td></td>
<td>Construction stockpile area</td>
<td>1.88</td>
<td>Temporary land occupation</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21.63</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zone</th>
<th>Prevention area</th>
<th>Area (hm²)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liujiang Town</td>
<td>Construction and structure area</td>
<td>0.15</td>
<td>Permanent land occupation</td>
</tr>
<tr>
<td></td>
<td>Road, bridge and square area</td>
<td>3.09</td>
<td>Permanent land occupation</td>
</tr>
<tr>
<td></td>
<td>Landscape and green area</td>
<td>5.06</td>
<td>Permanent land occupation</td>
</tr>
<tr>
<td></td>
<td>Water area</td>
<td>2.2</td>
<td>Permanent land occupation</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>10.51</td>
<td></td>
</tr>
</tbody>
</table>

2. Displacement and resettlement

The influence of Liujiang Town Subproject can be caused to the residents in Liujiang Town, Hongya County and the Yang Village, Lianghe Village and Hongxing Village under its Jurisdiction. 86 households and 320 persons are influenced by this Project in total.
Table 2-11 List of Project Displacement and Resettlement

<table>
<thead>
<tr>
<th>Town</th>
<th>Impacted village</th>
<th>Population under direct impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Households</td>
</tr>
<tr>
<td>Liujiang Town</td>
<td>Liu village</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lianghe village</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Hongxing village</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>86</td>
</tr>
</tbody>
</table>

2.3.10 Construction schedule and construction organization

1. Construction schedule

The preliminary work of this project lasts from January 2015 to December 2015. The construction period of this Project lasts from January 2016 to December 2016. The construction progress and schedule of this Project is as shown in Table 2-12.

Table 2-12 Project Progress and Schedule

<table>
<thead>
<tr>
<th>Working stage</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary work</td>
<td>January 2015 to December 2015</td>
</tr>
<tr>
<td>Project construction</td>
<td>January 2016 to December 2016</td>
</tr>
</tbody>
</table>

2. Construction organization

(1) Site conditions

The construction area of this Project is located in Hongya County. It is found after the site survey that this Project is located in a plain terrain and the conditions of the construction site are well.

(2) Transportation conditions

There are several existing roads in the project location. In such case, the external traffic conditions of this Project are very good and the materials, the food, the machine and the tools can be conveniently transported.

(3) Natural climate condition influence to construction

The Project location is in the north subtropical humid monsoon climate. Once the construction plan is well arranged, the construction can be implemented all the year around. The natural and climate conditions are beneficial for the construction.

(4) Road material

The sands gravels and pebbles, required by the works, can be purchased from the stock yard of this city and then transferred to the construction site. The cement and the steel material can be purchased in Meishan City. The asphalt material shall be purchased from other resources. The high-voltage power line is available along the water line. Please contact the local electric power...
sector during the project implementation. The power supply can be provided by connecting to the nearby power line to ensure the construction of project and works.

Road material requirements: it is specified in the environment assessment requirements that the environmental-friendly constructional materials shall be used in the construction.

(2) Construction organization and management

The Project will adopt the open tendering and bidding system for the investigation, design, construction and supervision. The excellent organization with rich experiences shall be appointed to undertake the investigation, design, construction and supervision work of this Project. The clear environment protection terms shall be listed in the Invitation for Bid and the construction contract. The construction organization shall promise to execute and implement the environment protection measures specified in this environmental impact report. To ensure the work quality and the construction period, the project construction and management departments must strictly follow related quality management system, complete the quality and progress management system of each level and well coordinate between the Owner, the Designer, the Supervisor and the Construction organization.

Before the mobilization, the construction organization shall make a site survey to define the environment status of the construction site and the temporary sites. It is specified in the environment evaluation requirements that the construction personnel and the management staffs shall rent the local house to reduce the damage to the ecology caused by the new land occupation. To reduce the environmental impact, the domestic sewage and the domestic garbage shall be treated with the existing treatment facility. For the construction machinery producing high noise, the construction shall be arranged in the day as per the measures specified in the report. Please do not disturb the residents. The coordination and cooperation between the slope greening works and the subgrade construction shall be well done. The planting soil, the shrub, the trees and other plants, from the site, shall be used in the greening works, so as to relieve the difficulties of taking the planting soil and purchasing a large quantity of nursery stocks for the landscape and greening works of this Project.
3.0 Project Analysis

3.1 Analysis of environmental problems of the Project

The Project mainly includes two subprojects in two areas of Hongya County, involving river channel works, sewer works, road works, bridge works and water supply works. Environmental problems of the Project mainly come from the adverse impact of construction and operation on the environment, mainly including permanent and temporary occupation of land for the project construction, impact of excavation on ecological environment such as water body, vegetation, etc., and noise and exhaust of vehicles, waste water and waste residue, etc. of water purification plant in the water supply works during the construction and operation period. The pollution impact of Hongchuan Town Subproject only occurs in the construction period rather than the operation period. The specific environmental pollution analysis of the Project is shown in Table 3-1.

<table>
<thead>
<tr>
<th>Period</th>
<th>Affected Object</th>
<th>Source and Link</th>
<th>Main Pollutant and Influence Factor</th>
<th>Affected Area</th>
<th>Impact Degree</th>
<th>Impact Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ecological environment</td>
<td>Construction, land acquisition</td>
<td>Vegetation damage, soil erosion, soil and water loss caused by the earthworks and stoneworks</td>
<td>The construction area</td>
<td>Relatively serious</td>
<td>Short-term impact</td>
</tr>
<tr>
<td></td>
<td>Noise</td>
<td>Transportation and construction machinery</td>
<td>Construction noise</td>
<td>The construction area</td>
<td>Serious</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atmospheric environment</td>
<td>Construction dust, construction machinery fuel exhaust</td>
<td>CO, NO₂, PM₁₀</td>
<td>The construction area</td>
<td>Serious</td>
<td>Temporar y, synchronous with the construction period</td>
</tr>
<tr>
<td></td>
<td>Water environment</td>
<td>Construction waste water, domestic sewage, construction machinery oily waste water</td>
<td>SS, CODcr, petroleum</td>
<td>Access roads</td>
<td>Relatively serious</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solid waste</td>
<td>River dredging</td>
<td>Silt</td>
<td>The construction area</td>
<td>Obvious</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3-2-2 Pollution Analysis of the Project (Liujiang Town)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Table 3-1-1 Pollution Analysis of the Project (Hongchuan Town)
### 3.0 Project Analysis

<table>
<thead>
<tr>
<th>Period</th>
<th>AFFECTED OBJECT</th>
<th>Source and Link</th>
<th>MAIN POLLUTANT and INFLUENCE FACTOR</th>
<th>Affected Area</th>
<th>Impact Degree</th>
<th>Impact Nature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation period</td>
<td>Noise</td>
<td>Vehicle traveling</td>
<td>Traffic noise</td>
<td>Both sides along the roads, the parking area</td>
<td>Serious</td>
<td>Obvious</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Equipment of water supply plant</td>
<td>Equipment noise</td>
<td>Water purification plant area</td>
<td>Obvious</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Atmospheric environment</td>
<td>Automobile exhaust</td>
<td>CO, NO₂</td>
<td>Both sides along the roads, the parking area</td>
<td>Relatively serious</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water environment</td>
<td>Pavement stormwater runoff</td>
<td>CODcr, SS, petroleum</td>
<td>Along the roads, receiving waters</td>
<td>Relatively minor</td>
<td>Long-term impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dredge waste water of water supply plant</td>
<td>CODcr, ammonia nitrogen</td>
<td>Receiving waters</td>
<td>Relatively minor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social environment</td>
<td>Transport scattering</td>
<td>Waste slag</td>
<td>Along the roads</td>
<td>Relatively minor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water purification plant</td>
<td>Silt</td>
<td>Water purification plant area</td>
<td>Minor</td>
<td></td>
</tr>
</tbody>
</table>

#### Table 3-3-2 Pollution Analysis of the Project (Liujiang Town) (Continued)

3.2 Introduction to process flow during construction period

1. River channel works

River channel works of the subproject is mainly divided into river dredging works and river embankment construction works. Construction of river reconstruction works mainly adopts the segmented construction methods. River dredging works is a segmented works, the river...
embankment construction should be carried out after the part of the river section dredging works is completed. Specific construction process is as follows:

![Diagram of Production Process Flow and Pollution Location during Construction Period of River Channel Works](image)

**Figure 3-1 Diagram of Production Process Flow and Pollution Location during Construction Period of River Channel Works**

Construction process flow of river channel works is outlined as follows:

1. **River dredging works**

   The Project includes dredging of the section of Hongchuan Town moat Fenghe Bridge flowing into Qingyi River via Niujiao Bay, with a dredging volume of 106,800 m$^3$ according to the monitoring results of bottom sediment by the monitoring unit, various sediment soil indicators are in line with Class II standards of *Soil Environmental Quality Standards* (GB15618-1995), without heavy metals exceeding the standard. Since there is no disconnection phenomenon of moat during dry season, the dredging method adopts segmented cofferdam method, namely, cofferdam diversion is performed for part of river sections requiring dredging during dry season. The construction cofferdam can be built by woven bags filling with excavation soil. Then the water in the cofferdam is drained off, and the mud scraper is used to remove the surface sediment. The silt should go to the sedimentation tank for treatment. The supernatant is discharged into the water body, a part of the dried silt is used for landscape planting soil back paving and landscape modeling for the wetland landscape within the Project area. The remaining silt is packed in the woven bags to be transported by sealed vehicles to be used as landscape greening planting soil for Hongya County municipal road construction.

2. **River embankment works**

   The embankment works of the Project adopts gravity-type masonry, and the embankment space is determined on the premise of ensuring the flood discharge capacity of the river, and combining with urban planning, safe flood discharge capacity of the river is mainly ensured and with due regard to leave some room for urban planning for the river sections not planned. Relocation, excavation and embankment quantities should be minimized and be useful for the future operation and management. The embankment space is determined according to the planned
river width for the river sections with sufficient flood discharge capacity. Each embankment line is arranged in parallel with a certain embankment space and river width. In addition, the river bottom of part of the river sections should be provided with a gravel cushion, and the river banks utilize vegetation for slope protection construction to build ecological river.

2. Sewage pipe works

Survey should be carried out according to relevant provisions of *Survey Specification for Municipal Works* before trench excavation. Construction organization design for trench excavation slope gradient, support measures, etc. should be prepared, and should be practically implemented during the construction to ensure safety. Local sites require greater burial depth, any sections with greater excavation depth and unstable slopes should be specially treated according to *Interim Provisions on Deep Foundation Support Works Management of Sichuan Province*.

3.2.2 Liujiang Town Subproject

1. Road works

Road construction works mainly includes land acquisition, removal, earthworks, stoneworks, subgrade and pavement works, drainage works, greening works, etc. process flow and pollution location of road works construction are as follows:

![Diagram of Production Process Flow and Pollution Location during Construction Period of Road Works](image)

Main construction processes of road works are outlined as follows:

1. Earthworks and stoneworks of subgrade

   Earthworks and stoneworks of subgrade mainly adopt mechanical construction, and are supplemented by manual construction. Excavation road sections should be arranged with multiple working faces with bulldozer or excavator operation under the condition of verification of length and quantities. The excavation earth and stones should be transported by loaders and dumper trucks to filling road sections for embankment filling or is abandoned in temporary dumping site, or adopt scraper for continuous excavation. Filling road sections should be leveled by loaders or bulldozers accompanied by manual leveling, and be compacted by rollers.

2. Pavement works

   Each structural layer of the pavement should be done by professional teams to ensure the
smoothness and quality of the pavement works.

Subbase and base adopt mechanical mixing, stratified paving by paver, roller compaction; each surface layer adopts spreader to spray oil-pervious layer; the paver with dump trucks for continuous spreading of cement concrete mixture; rolling compaction molding by rollers; and the mixture is provided by the mixing station with mechanically mixing method.

2. Bridge works

Huaxi River major bridge boasts a main arch span of 60 m, Yangliu River medium bridge boasts a main arch span of 30 m, and Yangliu River Footbridge boasts a main arch span of 55 m. All of them adopt cast-in-situ pile foundation. The whole bridge is provided with seismic simulation calculation, with the results of: the deformation displacement, plastic hinge, strength, shear resistance meet regulatory requirements under 8 degrees earthquake condition. Upon completion of construction of bridges, the bridge floor is provided with cast-in-situ cement concrete, then asphalt concrete, and finally installation of safety equipment such as railings, etc., demolition of access roads, removal of construction rubbish, recovery of trees, vegetation and embankment, river channel, etc. to pre-construction state. The bridge works of the subproject is not provided with wading pier and wading construction.

3.3 Introduction to process flow during operation period

The operation period of Hongchuan Town Subproject has no pollution impact, therefore, the Introduction to process flow during the operation period focuses on Liujiang subproject. Main process flow of during the operation period is the raw water treatment process of the water purification plant of water supply works. The water purification plant of water supply works adopts the current conventional treatment process flow of "flocculent precipitation-filtering-disinfection process" for raw water treatment according to the raw water quality characteristics. And all indicators of the raw water after treatment can meet or better than the indicators defined in the Health Standards for Domestic Drinking Water, the finished water turbidity can be less than 0.50NTU.

3.4 Main impact source analysis during construction period

3.4.1 Social environment

3.4.1.1 Land requisition and removal

Hongchuan Town Subproject covers an area of 21.63hm², mainly covering flood wasteland; Liujiang Town Subproject covers an area of 10.51hm², mainly covering cultivated land and garden area. Among them, Hongchuan Town Subproject includes no new land occupation, Liujiang Town Subproject includes new land occupation of mainly rural collective land of Yang Village and
Lianghe Village of a total arable land of 1.31hm$^2$. Permanent occupation of land will change the current status of land use, resulting in reduced dry land, having some impact on the life of local residents. Provisional occupation of land is located within the range of permanent land acquisition and will have little impact on the local land resources and vegetation. The project only involves the permanent acquisition of collective land, without removal of rural housing, enterprises/institutions, shops, ground attachments and infrastructure, etc.

3.4.1.2 Construction activities

The coming in and out of construction vehicles and the occupancy of the existing roads will affect the travel of the residents within the area; in particular, some of the existing roads within the area will serve as the main roads during the construction period. The coming and going of vehicles of the Project will cause dust pollution and reduce the quality of life of nearby residents; in addition, construction noise and traffic noise will also affect the rest of residents within the project area, roads, pipelines radiation areas, the most affected area is within 100m range of the project construction area.

Project construction mainly depends on the existing roads within the area to ensure that the movement of persons of the project area. The emissions of production waste water, domestic sewage, domestic rubbish, production solid waste, and the degree of civilization of the construction workers are likely to impose impact of varying degrees on the daily life of local villagers.

3.4.2 Ecological environment

3.4.2.1 Vegetation reduction, water and soil loss

The impact of requisition of land of various works of the Project is irreversible.

Earth and stone excavation, road works, subgrade filling, etc. processes of the Project result in damage of vegetation, occupation of vegetation and soil, bare ground along the line, leading to changes of local ecological structure along the line. Bare ground after excavation will subject to a lot of soil erosion under the influence of rain and surface runoff.

Temporary land during the construction process of the Project mainly includes the construction site, temporary soil stacking yard, etc. The temporary land will have a direct role in the destruction of vegetation, resulting in reduced biological diversity of communities.

The loss of vegetation caused by the Project can be compensated to a large extent by greening of both sides of the roads, river landscape greening works and regional urban stormwater gardens, etc.
3.4.2.2 Ecological and landscape impact

The land occupation of the Project is mainly dry land, and the new land use is arable land. The construction area of the Project will cause damage to soil resources and vegetation along the line and other construction area. From the results of the survey on the current situation of vegetation distribution, the vegetation types directly affected by the Project are mainly dry land crops, forest vegetation, etc. The land occupation of the Project will have a direct role in the destruction of vegetation, and complete destruction of agricultural cultivation vegetation and forest vegetation, which are replaced by roads, commercial streets and auxiliary facilities, forming the type of construction land, thus reducing biodiversity of community.

The construction area of the Project is located within the city without a lot of animals living there, so the Project has little effect on the regional animal. The land occupation of the Project mainly includes dry land and water area. After the completion of the Project and immigration, size changes of various piecing plot types will lead to changes in the productivity and stability of the regional natural ecosystem, and has a certain effect on the ecological integrity of the region.

3.4.3 Acoustic environment

Noise pollution source during the construction period is mainly generated by the construction machinery. Based on the measured data of commonly used machinery, the noise value of construction machinery is shown in Table 3-2.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>Distance from Measuring Point to Construction Machinery (m)</th>
<th>Lmax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wheel loader</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Grader</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Vibrating roller</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>4</td>
<td>Double-wheel double-vibrating roller</td>
<td>5</td>
<td>81</td>
</tr>
<tr>
<td>5</td>
<td>Three-wheel roller</td>
<td>5</td>
<td>81</td>
</tr>
<tr>
<td>6</td>
<td>Pneumatic tyred roller</td>
<td>5</td>
<td>76</td>
</tr>
<tr>
<td>7</td>
<td>Bulldozer</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>8</td>
<td>Hydraulic tyred excavator</td>
<td>5</td>
<td>84</td>
</tr>
<tr>
<td>9</td>
<td>Paver</td>
<td>5</td>
<td>87</td>
</tr>
<tr>
<td>10</td>
<td>Generator</td>
<td>5</td>
<td>98</td>
</tr>
<tr>
<td>11</td>
<td>Impact well drill</td>
<td>5</td>
<td>87</td>
</tr>
<tr>
<td>12</td>
<td>Impact pipe hammer</td>
<td>5</td>
<td>112</td>
</tr>
<tr>
<td>13</td>
<td>Truck</td>
<td>5</td>
<td>92</td>
</tr>
<tr>
<td>14</td>
<td>Concrete and asphalt mixer</td>
<td>5</td>
<td>91</td>
</tr>
<tr>
<td>15</td>
<td>Concrete pump</td>
<td>5</td>
<td>85</td>
</tr>
<tr>
<td>16</td>
<td>Mobile crane</td>
<td>5</td>
<td>96</td>
</tr>
<tr>
<td>17</td>
<td>Pneumatic hammer and jackdrill</td>
<td>5</td>
<td>98</td>
</tr>
</tbody>
</table>
Noise effect during construction period mainly embodies in the interference of the traffic noise of access roads to the residents on both sides of the access roads, and effect of the construction machinery noise of construction machinery site such as mixing station, etc. on nearby residents. The effect of access road traffic noise is within the range of 100m on both sides of the access roads, and construction machinery noise is mainly within the range of 350m from the construction site. The Project is new project and the project construction will cause the traffic noise of construction vehicles. But, the impact is temporary due to the discontinuity of transport vehicles during construction period of the Project. Therefore, the impact of the above added noise will be reduced or eliminated with the completion of construction.

3.3.4 Ambient air

Construction exhaust gas of the Project mainly comes from construction dust, construction machinery exhaust and asphalt smoke produced by pavement laying process of road and bridge works. In addition, temporary stockpiling of silt generated by river channel works of Hongchuan Town Subproject project will produce a certain stench.

1. Construction dust

① TSP

Main pollution link of TSP is construction dust of preliminary stage, the minor pollution links are dust mixing, concrete mixing lime, earth and stone excavation, backfilling, etc.

In addition, transport and stacking of the building materials, earth and stone excavation, backfilling, etc. of the Project will produce TSP pollution to local area of the construction site, the pollution scope and extent relate to a variety of factors such as the construction technology, construction management, weather conditions, etc. Advanced construction technology and scientific construction management may substantially control the TSP pollution range within the construction boundary.

② Road dust

Transport vehicles during construction period will produce secondary road dust pollution, especially the vehicles traveling on the existing large roads. According to the on-site monitoring results of dust caused by vehicle transport of similar construction site, TSP concentration is 11.625mg/m³, 9.694mg/m³ and 5.093mg/m³ respectively at 50m, 100m and 150m of the downwind of the dust transport vehicles, exceeding the Class II ambient air quality standards. In view of the many settlements on both sides of the existing roads, ambient air monitoring and vehicle management of transport roads during the construction period should be strengthened to
reduce air pollution caused by road dust.

2. Construction machinery exhaust

   Project construction vehicles and construction machinery will produce a small amount of construction waste gas during operation. During the construction period, motor vehicles used to transport raw materials and equipment, and construction machinery and equipment will emit a certain amount of CO, NO2 and imperfectly combusted HC, etc., which is characterized by low emission levels, and intermittent fugitive emissions.

3. Asphalt smoke

   The Project will purchase the finished asphalt from the asphalt mixing plant for paving. Asphalt smoke will be produced during paving of asphalt. According to the monitoring results of asphalt smoke pollution of similar roads, the concentration of asphalt smoke measured in the roadside is between 30 and 50 mg/m³, less than 75 mg/m³ of the Class II standard of Atmospheric Comprehensive Pollution Emission Standards.

4. Stench produced by temporary stockpiling of silt

   Silt produced during dredging construction of river channel works of Hongchuan Town Subproject will be temporary stored, which may produce some stench, resulting in impact on regional ambient air.

3.4.5 Water environment

   Construction sewage, domestic rubbish and domestic sewage of construction workers during the construction period of the Project may affect river water environment of Huaxi River, Yangcun River and Yangliu River of Liujiang Town Subproject, and Hongchuan Town moat, with the main pollutant factors of petroleum, pH, SS, COD, BOD5, etc.

   Waste water during the construction period mainly includes a certain amount of mixing waste water generated by concrete mixing at the construction site during construction process. Direct discharge of the above waste water without treatment will cause pollution to nearby surface and water bodies. The above waste water generated during construction period is about 8m³/d, and is recycled after oil separation precipitation treatment, and is forbidden to be directly discharged into the nearby water bodies.

   Domestic sewage produced by construction workers of the Project reaches about 50L/person •d. Calculated as 100 persons at the construction sites and according to 80% pollutant producing coefficient, the domestic sewage amount reaches about 4m³/d. The construction workers of the Project rent nearby local houses, therefore, the construction and domestic sewage is treated by the local existing treatment facilities. It has little effect on the surrounding environment.
In addition, the implementation of river channel works of Hongchuan Town Subproject will disturb Hongchuan Town moat river body, resulting in suspended solids and affecting water quality. However, as the construction of river channel works of the Project adopts cofferdam construction technology, in addition to the disturbance to the riverbed during cofferdam construction, the construction process is carried out within the cofferdam, basically ensuring the separation of construction process from water bodies. Coupled with the river water function of flood discharge and irrigation, the project construction will impose little and temporary impact on river water quality, which will disappear with the completion of the construction in water of river channel works.

3.4.6 Solid waste

Solid wastes during the construction period of the Project mainly include waste earthwork and stonework during construction, construction rubbish and river silt.

(1) Waste earthwork and stonework during construction

According to the balance analysis of earthwork and stonework of the Project, the Project generates no waste earthwork and stonework.

(2) Construction rubbish

Construction rubbish mainly comes from construction waste (such as waste packaging materials, waste materials, etc.) as well as domestic rubbish of construction workers. The number of construction workers during peak hour reaches about 100, the amount of domestic rubbish generated per person adopts 0.5kg/person •d, the rubbish amount generated during construction is approximately 50kg/d. Domestic rubbish should be collected in designated location, together with a small amount of construction waste will be submitted to the local sanitation department for disposal.

(3) River silt

Hongchuan Town Subproject will produce 106,800 m$^3$ of river silt as a result of river dredging. Part of the silt after temporary storage and drying will be used for wetland landscape planting soil backfilling and landscape modeling within the Project area, and the remaining silt will be used as landscape greening planting soil for Hongya County municipal road construction.

3.5 Environmental impact source analysis during operation period

The main environmental impact sources after the operation of the Project are from Liujiang Town Subproject, as its road and bridge works will produce environmental impacts such as automobile exhaust and traffic noise. The operation of water purification plant of water supply works will generate production and domestic waste water, dewatering silt, etc. The specific impact
source analysis of the Project during operation period is as follows:

3.5.1 Social environment

3.5.1.1 Positive effect of the Project on society

The road works and bridges works of Liujiang Town Subproject is an important part of the Liujiang Town road network structure. The connection with other roads will promote the rapid development of the regional transport and the national economy. The project construction is of great significance as it can promote the development of local economy and the tourism industry. The selection of road and bridge works has fully considered the impact and promotion effect on residents along the line. The area of the Project is provided with necessary exchange facilities, which can better meet the development needs of the local economy, and promote local economic development.

River channel works of Hongchuan Town Subproject mainly includes reconstruction of tail river section of Hongchuan Town moat, mainly through regional vegetation landscape greening construction to further form an overall ecosystem environment of downstream river section along the river bank. It is conducive to the formation of the regional landscape ecosystem to further improve the environmental quality of the area. The sewage pipe works mainly involve laying sewage interception trunk pipe in the section from Fenghe Bridge to Niujiawan (Zhuhekan Village). In the past, the sewage from the unimproved areas was discharged directly into Qingyi River without any treatment, polluting the water body to some extent. The sewage pipe works can effectively avoid entry of the sewage from this section into the water body, and thoroughly connect the sewage pipes on both sides of the inland river to form a complete urban sewage interception system. The sewage collection in this area will be increased to 100%, and the quality of the discharged water will reach the 1B standard in Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB18918-2002), reducing the COD and NH$_3$-N emission, greatly improving the water environment and effectively guaranteeing people health, with obvious positive effect on the water environment quality.

3.5.1.2 Coordination with urban planning

The selection of construction of roads and bridges of Liujiang Town Subproject has fully considered the harmonious development relations with urban planning, urban transport and social development plan. Road works routes uses the planned transport corridors within the project area, and taking full consideration of local overall urban planning and economic development needs, and soliciting the views of relevant local authorities during determining the specific routes. The finalized route is in line with the wishes of the local government sector and the overall planning.
requirements of Liujiang Town.

In addition, the river channel works of Hongchuan Town Subproject mainly include reconstruction of the landscape along the river bank, further forming the urban ecosystem and helping to further the implementation of urban planning. In summary, the construction of the Project is harmonious with the relevant overall planning of Hongchuan Town.

3.5.2 Acoustic environment

The noise during operation of the Project mainly comes from the proposed road works, bridge works and water purification plant equipment of water supply works of Liujiang Town Subproject.

1. Road and bridge works

Source of noise pollution during the operation period of road works is mainly the noise of vehicles travelling on the roads. According to the results of Road Traffic Noise Emission Source Test, the determined average sound level of all types of vehicles at different speeds is shown in Table 3-3.

<table>
<thead>
<tr>
<th>Car type</th>
<th>Average Sound Level (dB)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large car</td>
<td>78</td>
<td>( V_r=0.8V_m )</td>
</tr>
<tr>
<td>Medium car</td>
<td>77</td>
<td>( V_m ) refers to average speed of medium car</td>
</tr>
<tr>
<td>Small car</td>
<td>76</td>
<td>( V_s ) refers to average speed of small car</td>
</tr>
</tbody>
</table>

Traffic noise generated by road and bridge works during operation period will cause interference of varying degrees to the residents on both sides. Noise effect during the operation period can be well controlled by taking necessary management and protective measures.

2. Water supply works (water purification plant)

Noise during operation of water purification plant are mainly generated by blowers, pumps, matched motors, etc., with general sound level value of 80 ~ 85dB (A). Project noise source and control are shown in Table 3-4.

<table>
<thead>
<tr>
<th>Equipment Name</th>
<th>Working Condition</th>
<th>Sound Pressure Level dB (A)</th>
<th>Control Measures</th>
<th>Sound Level after Treatment dB (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water pump</td>
<td>Continuous</td>
<td>85</td>
<td>Reasonable layout, acoustic doors and windows</td>
<td>( \leq 70 )</td>
</tr>
<tr>
<td>Blower</td>
<td>Continuous</td>
<td>80</td>
<td>Reasonable layout, vibration reduction</td>
<td>( \leq 65 )</td>
</tr>
</tbody>
</table>

3. New ecological parking lot works

The noise of the Project is generated by vehicles. Through analogy analysis, the project noise source and control are shown in Table 3-5.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Noise Source</th>
<th>Sound Pressure</th>
<th>Production Position</th>
<th>Disposal Measures</th>
<th>Discharge Conditions</th>
</tr>
</thead>
</table>
3.0 Project Analysis

### 3.5.3 Ambient air

The impact on ambient air of the area during the operation period of the Project mainly comes from the proposed road works, bridge works and ecological parking lot works of Liujiang Town Subproject.

1. **Road and bridge works**

Air pollutants during the operation period of the road works of the Project mainly include automobile exhaust. The average daily emissions of NO\(_2\) in the automobile exhaust can be calculated as per the following formula:

\[
Q_J = \sum_{i=1}^{3} \frac{3600}{J} A_i E_{ij}
\]

Where: Q\(_J\) refers to sound pressure level of J pollutant emitted by driving car at a certain speed, mg/(m•s);

A\(_i\) refers to hourly traffic volume of i type car, car/h;

E\(_{ij}\) refers to single car emission coefficient, volume of J pollutant emitted by single car of i type at a certain speed, mg/vehicle•m.

<table>
<thead>
<tr>
<th>Average Speed</th>
<th>Small car</th>
<th>Medium car</th>
<th>Large car</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO</td>
<td>NO(_x)</td>
<td>CO</td>
</tr>
<tr>
<td>50.00</td>
<td>31.34</td>
<td>1.77</td>
<td>5.40</td>
</tr>
<tr>
<td>60.00</td>
<td>23.68</td>
<td>2.37</td>
<td>6.30</td>
</tr>
<tr>
<td>70.00</td>
<td>17.90</td>
<td>2.96</td>
<td>7.20</td>
</tr>
<tr>
<td>80.00</td>
<td>14.76</td>
<td>3.71</td>
<td>8.30</td>
</tr>
<tr>
<td>90.00</td>
<td>10.24</td>
<td>3.85</td>
<td>8.80</td>
</tr>
<tr>
<td>100.00</td>
<td>7.72</td>
<td>3.99</td>
<td>9.30</td>
</tr>
</tbody>
</table>

According to the above sound pressure level of pollutants, through analogy of similar road, it can be known that the scope of vehicle exhaust during the operation period mainly concentrates on both sides of the road within 20m range from the road centerline. The implementation of the greening works on both sides of the road of the Project can largely reduce the effect of automobile exhaust on sensitive points on both sides of the road.

2. **New ecological parking lot works**

New ecological parking lot of Liujiang subproject is a ground parking lot. Its operation period will generate a small amount of automobile exhaust, mainly containing CO, NO\(_x\), TSP, and imperfectly combusted hydrocarbons. Commercial street parking lot is arranged near the north side.
of the street, and is an open space. Exhaust produced by vehicles during coming in and out of parking lot will be diffused and diluted, and belongs to fugitive emissions.

3.5.4 Water environment

Waste water produced during the operation period of Liujiang Town Subproject mainly includes two types, namely, pavement runoff of roads and bridges, and silt disposal waste water of water purification plant of water supply works. Specific water environment impact sources of the Project are shown as follows:

1. Road and bridge works

The pollution means for the nearby water area during the operation period of road and bridge works of the Project are mainly pavement runoff. In event of a fault, an accident, etc. due to poor vehicle maintenance status, it may lead to leakage of gasoline and machine which will pollute the road. In case of rain, the stormwater flows into Huaxi River and Yangliu River via road drain outlet, causing oil and COD pollution. According to the measured results and literature data, the concentration of pavement pollutants is shown in the following Table 3-7.

<table>
<thead>
<tr>
<th>Item</th>
<th>pH</th>
<th>CODcr</th>
<th>BOD5</th>
<th>SS</th>
<th>Petroleum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average runoff within 2 hours</td>
<td>7.4</td>
<td>107</td>
<td>20</td>
<td>221</td>
<td>7.0</td>
</tr>
</tbody>
</table>

2. Water supply works (water purification plant)

Production waste water during operation period of new water purification plant of the Project is mainly from silt water of sedimentation tank and backwash water of filter. Among them, the silt water amount is about 89m$^3$/d and the backwash water amount is about 78m$^3$/d. The backwash water is mainly recycled by recycling tank without being discharged to the outside; silt disposal water and the supernatant liquid are discharged to the nearby ditches in line with the standards.

Domestic sewage amount of the water purification plant of the Project is about 1.1m$^3$/d, with main pollutants of COD$_{cr}$, BOD$_5$, SS, ammonia nitrogen, etc. Domestic sewage amount of the water supply plant of the Project is transported by sewage tankers to the local sewage treatment plant for treatment.

3.5.5 Solid waste

1. Road and bridge works

Solid waste during the operation period of road and bridge works is mainly from the domestic rubbish generated by the vehicle passengers and curing personnel. Since solid waste during the operation period is generated in the area close to the roads and bridges, and is closely related to people's lives, it will cause impact on landscape air pollution, the spread of disease, and human health hazard if not properly disposed. Therefore, it should be submitted to the sanitation
department to send to local waste disposal plant for unified treatment.

2. Water supply works (water purification plant)

Solid waste of the production plant area of the water purification plant includes dried silt and office and domestic waste. The dewatered silt amount of the Project is about 1.4t/d. The number of the production personnel of the plant area is about 11, and the office and domestic waste is about 5.5kg/d (2.007t/a) calculated according to an average office and domestic waste of 0.5kg/person •day.

Disposal measures: the dried silt is transported to the landfill yard for disposal; office and domestic waste is collected in a concentrated manner, and is submitted to the local sanitation department for unified disposal.
4.0 Environment Overview and Status Assessment

4.1 Natural environment overview

There is no wild life reserve or primeval forest, large area of forest land or large wild life in the area where the Project locates due to the long-time human production and living activities. The wild lives in the area at present mainly are insects and mice, without rare wild lives under the state and local key protection. The land within the Project area has been long used, and natural vegetation has been replaced by artificial vegetation. Trees are not numerous, and the vegetation mainly is herbaceous and bush. There is no old tree or famous wood species and rare plants that need special protection. There is no rare aquatic organism within the scope of river reach affected by the Project.

4.2 Environmental quality status survey and assessment

4.2.1 Ambient air status monitoring

The monitoring results show that the daily average concentration of PM$_{10}$ at all points within the scope of assessment meets the requirements of the secondary standard Ambient Air Quality Standard (GB3095-2012), and that of SO$_2$ and NO$_2$ also meets the requirements of the secondary standard Ambient Air Quality Standard (GB3095-2012). The ambient air quality in the area where the Project locates is good.

4.2.2 Surface water environmental status monitoring

The monitoring results show that the quality indicators of water from Liujiang River, Yangcun River and Huaxi River within the area of the Project all meet the third-grade criterion described in the Environmental Quality Standard for Surface Water (GB3838-2002). Therefore the surface water environmental quality within the area of the Project is relatively good in general.

4.2.3 Acoustic environmental status monitoring

The monitoring results show that the noise measured at all monitoring points within the project area meets the second-grade criterion described in the Environmental Quality Standard for Noise. Therefore, the acoustic environmental quality of the project area is good.

4.2.4 Groundwater environmental status monitoring

The monitoring results show that the measured values of groundwater quality within the project area of Hongchuan Town Subproject all meet the third-grade criterion described in the Quality Standard for Underground Water (GB/T14848-93). The indicator total coliforms detected in the underground water for peasant households in Yangcun Village within the project area of Liujiang Town Subproject exceeds limits, which mainly results from the discharge of rural
domestic waste water.

4.2.5 **Soil (sediment) environmental status monitoring**

The monitoring results show that the concentration of assessment factors in the soil (sediment) at the 2 monitoring points does not exceed the limits. All indicators meet the requirements of the secondary standard of *Environmental Quality Standard for Soils* (GB15618-1995).
5.0 Environmental Impact Assessment

5.1 Social Environmental Impact Assessment

5.1.1 Impact on social economy and industrial structure

Hongchuan Town and Liujiang Town in Hongya County cater to double opportunities: national new-type urbanization and formation of new world material culture tourist route – Great Emei Tourism Circle, but both towns have the bottleneck of development and the aspects need to be perfected and improved. The implementation of the project in Hongchuan Town is beneficial to improvement of the “Diverting Water from Qingyi River to the City” project in Hongchuan Town, overall governance and construction of environment along Hongchuan moat, completion of Hongchuan ecological city construction, as well as overall economic development of Hongchuan Town.

The implementation of the project in Liujiang Town is beneficial to development of Liujiang Town into tourist industry featured by ancient town and growth of regional overall tourist economy, improving the quality of living supporting facilities of the residents around and playing a positive role in improvement of residents’ living quality.

5.1.2 Impact on residents’ living quality

During the construction period of this project, it is needed to employ large amounts of labor and purchase a large amount of building materials, this provides a good opportunity for solving the problem of surplus labor in the engineering area and activating the exploitation of local materials; after the project is completed, the traffic condition in the engineering area has been improved greatly: on the one hand, it can speed up the trading circulation between urban center and suburb, accelerate the products access to market rapidly and timely and increase the income of farmers in suburb; on the other hand, the construction of commercial street of the project can promote the rising of third industry in the region and further development and utilization of resources, to offer a large number of employment opportunities for the society and promote the considerable development of local economy. In addition, the perfection of transportation infrastructure will make the exchange of all kinds of science and technology, culture, education, physical culture, health, communication, entertainment and other enterprises within the region increasingly frequent, and the cultural education enterprise will obtain a better development.

During the implementation of the project, it is still inevitable to bring a certain adverse impact on social environment in the region, for example: the construction vehicles access will occupy the existing regional road and have an impact on going out of regional residents; the
construction land acquisition will bring a part of demolition quantity; the waste gas discharged, noise generated and raising dust stirred by the construction vehicles and equipment will have an impact on living quality of nearby residents; the construction wastewater will have an impact on local surface water body if it is not disposed properly. According to the field investigation, during construction period, the affected objects are mainly the residential areas close to both sides of proposed road and rive works and the residents close to the surroundings of other construction sites; therefore, the project owner and construction unit shall take strict measures for prevention.

5.1.3 Impact analysis on land acquisition, demolition and resettlement

5.1.3.1 Land acquisition and demolition

The permanent lands in the project mainly include bench wasteland, rural collective land (cultivated land and garden plot) and river water surface. Liujiang subproject uses 10.51hm² of rural collective land, while the newly-added land is 1.31hm² and the type of land is cultivated land; Hongchuan subproject uses 21.63hm² of bench wasteland, with no newly-added land. The project construction does not involve in the demolition of rural residents’ housing, enterprise/public institution, shop, ground attachment and infrastructure, so the project has no impact on demolition.

Impact analysis on the land occupied by the project:

(1) Analysis of impact of permanent land occupation by the project on the land

According to the analysis on occupied land type of the project, the main occupied land types of the proposed works are dry land and river water surface, which will reduce the dry land and vegetation area within the project area to some extent and will have a certain adverse impact on soil texture within the project construction area. According to the overall planning for land utilization in Hongya County, the occupied dry land of the project construction has been considered in the local land utilization planning. The project is urban infrastructure construction and the planning land is urban construction land. Therefore, the occupied dry land of the project can be settled by the established measures in the planning.

(2) Analysis of impact of temporary land occupation by the project

The temporarily occupied land of the project is mainly used as the construction workshop, temporary soil yard and temporary silt storage yard, the floor area is about 3.94hm². For the above temporarily occupied land, during the construction operations, the crops and vegetation around the construction operations will be destroyed to varying degrees due to rolling compaction of machineries and trampling of constructors, which will cause the decrease of crops and forest land resources; however, the destruction impact of temporarily occupied land on vegetation lasts for a short term and is recoverable. In the project, the temporary land occupation area can be implemented within the permanent land acquisition area and it can be used as landscape green area.
after temporary occupation for construction. Therefore, the temporary land occupation area of the project can be carried out the slash restoration and implemented more perfect landscape engineering. So the temporary land occupation area of the project will not have significant impact.

5.1.3.2 Impact analysis on demolition and resettlement

The project only involves in the permanent acquisition of collective land. The procedures of land acquisition are reasonable and lawful; all kinds of compensations of the households affected by land acquisition are timely and fully granted in place; the various resettlement measures are implemented and the complaint and appeal channels are unobstructed and effective. The income and living standard of the households affected by land acquisition are recovered and improved comprehensively and the degree of satisfaction is high, which conforms to the relevant laws and regulations in our country and is consistent with the requirements of the World Bank OP4.12 involuntary resettlement policy. There are no left problems for collective land acquisition and compensation.

5.2 Ecological environmental impact assessment

5.2.1 Analysis of impact on plants and animals

5.2.1.1 Impact on plants

(1) Impact on plants during construction

① Impact on plant deterioration and land productivity

The permanent land occupation for project construction will occupy and damage the plants in the area and the construction will damage the growing environment of the plants. As a result, the bion will lose its growing environment and the impact extent is irreversible. The vegetation distribution status survey shows that the vegetations directly affected by the project are mostly of bushes and grasses.

During the project construction, the temporary construction land is the construction site and temporary soil accumulation site. The temporary construction land is the dry land and it will exert short-term direct impact on the land and the vegetations on the land. Vegetation will be affected largely. But the temporary engineering land of the project will be set within the permanent land acquisition scope and it will be used as the landscape green area after the occupation ends. Therefore, the temporary construction of the project will not affect the vegetations.

In conclusion, the permanent land occupation during the project construction will damage the vegetations and the damage is unrecoverable in long term.

② Impact on ecological structure

Human activities during construction: for example, the roadbed paving, excavation of pile
foundation on a commercial street, grinding of construction machinery, and treading of construction personnel will directly damage the bushes and grassland around the construction operation area, resulting in deterioration of biodiversities of the community.

The on-site survey shows that the affected vegetations within the project impact scope are common species which have broad growing range and strong adaptability. The loss of the land vegetation will have certain effect on the existing ecological system, but the loss area is very small compared with the project area. The plant greening adopted in the project and the recovery of the vegetation in the temporary construction land will make up for the lost biomass. Therefore, the construction activity will not affect the stability and integrity of the ecological system in the project area.

③ Impact of national key protected plants and old and famous trees

Through on-site survey and query in local county annals and related forestry data, no national key protected plants and old and famous trees are found in the project area.

(2) Impact on plants during operation period

① Edge effect’s impact on plant community succession

After the project is completed, the agricultural cultural vegetation and the forestry vegetation in the permanent land occupation will be thoroughly damaged. Instead, the construction land will be formed, such as road, commercial street and certain auxiliary facilities. The completion of this project will broaden the greening in the area, especially the construction of the landscape on both sides of the Hongchuan Town Subproject watercourse. So the forestry edge effect changes slightly. The changes to the environment factors such as optical radiation, temperature, humidity, and wind from forestry edge to forestry inside is small and the small climate change has slight impact on the plants, animals, and microorganism from forestry edge to forestry inside.

② Impact of alien species on local ecological system

With the engineers entering/exiting the assessment scope and in and out of the construction materials and vehicles, people will bring some alien species to the area either intentionally or unintentionally. If the alien species can adapt to and use the local environment better, they may decrease the number of local species. The bare land formed along the line may become the invasion path for the alien species and gradually becomes a local dominant community and thus repels the local vegetations. These first invaded communities will become the mono-dominant community. It will affect the natural succession of the phytocoenosium and lower the biodiversities in the region. During the construction period, it may have potential adverse effect on local biodiversities.
5.2.1.2 Impact on wild animals

(1) Impact on terrestrial animals

During the project construction, the construction of roads, bridges, watercourses, and water supply projects will damage the growing environment and life of some wild animals, such as snakes, rats, and some other reptiles. Some animals will migrate to other places and some will come back and become members of new ecological system again in the region when the vegetation in the construction area is recovered. Therefore, the project does not have great effect on them.

According to the ecology status analysis in the project area, the project area is mostly of dry land and human activities will have large effect. There are no national protected rare wild animals in the area. The number of national and local key protected wild animals is really rare, so the project does not have great effect.

According to Wildlife Protection Law of the PRC, during the project construction period, strengthen the environmental protection education to the construction personnel and propaganda the slogan of 'protect nature and love the wildlife” and prohibit the hunting of wildlife. For the wildlife found during construction, the construction personnel cannot kill them and they should immediately transfer and free them far away from the project area. If any unit or individual found injured, weak, starved, trapped, or lost national or local key protected wildlife, they should report to the local wildlife administrative department in time and the wildlife administrative department will take proper measures. They can also send the wildlife to the nearest unit with rescue condition and meanwhile report to the local wildlife administrative department in charge.

(2) Impact on fishes

The project involves the desilting work for the moat in Hongchuan Town and the river water will be stirred to a certain extent which will increase the suspended solids. The survey shows that the water in moat in Hongchuan Town is used for irrigation and flood discharge. There is no fish distributed in the project area, so the construction of the project has no effect on the fishes.

5.2.2 Impact on agricultural ecology

The land occupied by the project is the planned urban land without agricultural land, so it will not affect the agricultural ecology.

5.2.3 Impact on regional landscape

The impact on the landscape during the construction is reflected on the damage of filling-digging operation to vegetation, terrain, and geomorphology, resulting in increase in landscape homogeneity in the construction operation area, decrease in diversity, and worsening in terrain and geomorphology fragmentation.

5.2.3.1 Impact of construction on regional landscape
The impact of the project land occupation on the landscape is the impact on the vegetations and geomorphologic landscape in the area.

Impact of permanent project land occupation on landscape

The permanent project land occupation (for example, road and water supply works land occupation) has unrecoverable effect on the original vegetations on the land. So the project has great effect on the vegetation landscape in the area, such as surface excavation, vegetation damage, and terrain fragmentation in the project area, leaving strong visual contrast.

Impact of temporary project land occupation on landscape

The temporary land occupation refers to the land occupation of temporary soil accumulation site and construction site. Because the most temporary project will provide services to the project, is required that there is good terrain and transport condition and nice soil and vegetation condition. But the construction will have great interference to the land vegetations and geomorphology, such as environment pollution from production and living wastes, air pollution from flying dust, and burning and mechanical damages from excessive dust on the leaves, leading to visual pollution. However, the temporary occupied land has great fertility soil layer and is easy for reclamation use. After the project is completed, the temporary project land occupation area will be constructed for landscape greening. So it almost has no effect on the landscape.

5.2.3.2 Impact on the regional landscape after the completion of project

No scenic spots, cultural relics and historic sites are located within the assessment range of this Project. The terrain of this Project is composed of the plain. The earth surface is basically covered by the dry land. In the project design, the route location and orientation of the road is clear and the driver has the wide vision. Meanwhile, the road landscape and the riverside landscape in this region, formed due to the regional greening measures and beautification, corresponding to the surrounding landscape. This will reduce the landscape damage and the green land occupied by the project construction, form the new and dynamic urban landscape in this region and vitalize this region. Especially for the watercourse rectification works involved in this Project, once a quantity of plants are used as the greening measures in the works, the basis is created for the landscape construction on both banks of the city moat, the green space and the vegetation coverage of this region are effectively increased and the positive function is caused to the air purification in this region. To sum up, the construction of this Project can cause positive benefits to the environment.

5.2.4 Arrangement rationality analysis of temporary works

1. Temporary spoil area (temporary spoil area and temporary sludge stock yard)

This Project is located on a plain. The excavation is required by the road works and the water purification plant works, mainly including the earthwork from the subgrade construction and
excavation and the excavated earthwork from the pile foundation of the water purification plant. The landscape and greening works of this Project shall be partially filled. Thus, the excavated earthwork of this Project can be deployed and used between the works. No temporary spoil area is provided in this Project. One temporary sludge stock yard is provided for the Hongchuan Town Subproject, which is located at one side of the landscape area. The geological location of the sludge stock yard, covering the floor space of 2.06 hm², is as shown in Figure 3-1. No sensitive residential areas are located within 200m of the stock yard. The site of the temporary sludge stock yard is reasonable.

The drain shall be provided for the temporary sludge stock yard before the storage, which is used for collecting and treating the percolate from the sludge. As the sludge stock yard is located in a low position, the impermeable membrane shall be provided to realize the anti-leakage treatment and prevent the sludge percolate from polluting the soil and the underground water in this region. A sedimentation basin shall be built at the influx of drains, which is used for collecting the waste water produced during the sludge drying process. Once being collected in the drains around the site, the sludge percolate is treated in the sedimentation basin and discharged into the city moat. It is forbidden to discharge the sludge percolate to other locations. The desilting works of this Project shall be conducted in states and constructed with the regional landscape works. It is forbidden to excavate the sludge in the rainy season. After a short-term storage and treatment, the sludge from the desilting process shall be used as the planting soil in the wet land, used for moulding the landscape in the project area and used as the planting soil for landscape of municipal road construction in Hongya County. The temporary sludge stock yard, covering an area of 2.06 hm², can completely meet the storage requirement of 106,800 m³ sludge. In addition, the temporary sludge stock yard may cause the stink problems. It is specified in the environmental assessment requirements that the sludge shall be treated and transferred as much as possible after the temporary storage. The construction organization shall spray the disinfectant and the plant liquid on the temporary sludge stock yard every day, so as to relieve the pollution and influence of stink.

To sum up, seen from the site and the environment protection measures, the temporary sludge stock yard is reasonable and is able to meet the construction demand of this Project.

2. Construction site

The construction site of Hongchuan Town Subproject covers a total area of 1.88hm². The subproject is located in the sewage pipe construction area of Hongchuan Town and is seated on a dry land. It is found via the site survey that no residents are living within 200m of the construction site. Thus, no impact is caused to the environment. In addition, the construction site of this Project
is located at the downwind direction of this area. Therefore, the influence to the surrounding environment and air, caused by the construction dust, is effectively reduced. As a result, the construction site of this Project is reasonably arranged.

5.3 Acoustic environment impact assessment

5.3.1 Acoustic environment impact prediction during construction period

5.3.1.1 Prediction method

The noise of construction machinery is predicted and calculated as per the following models:

\[ L_i = L_0 - 20 \log(r_i/r_0) - \Delta L \]

Where, \( L_i \) - sound level from the sound source \( r_i \), dB (A);
\( L_0 \) - sound level from the sound source \( r_0 \);
\( \Delta L \) - noise attenuation caused by other factors, dB (A)

The synthetic sound level, produced by the sound source at the prediction points, shall be calculated as per the formula below:

\[ L_{tp} = 10 \log \left[ \sum_{i=1}^{n} 10^{0.1L_{pi}} \right] \]

5.3.1.2 Prediction result

The noise pollution during construction period is mainly produced by the construction machinery. According to the real measured data of common machine, the strength of pollution source is as shown in Table 5-1.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Type of machine</th>
<th>Model</th>
<th>Distance from the measurement point to the machinery (m)</th>
<th>Maximum sound level ( L_{max} ) (dB (A))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wheel loader</td>
<td>ZL40</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Wheel loader</td>
<td>ZL50</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Land leveler</td>
<td>PY16A</td>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>Vibrating roller</td>
<td>YZJ10B</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>5</td>
<td>Double-wheel double-vibration roller</td>
<td>CC21</td>
<td>5</td>
<td>81</td>
</tr>
<tr>
<td>6</td>
<td>Three-wheel roller</td>
<td>ZL16</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>7</td>
<td>Pneumatic tyre roller</td>
<td>ZL16</td>
<td>5</td>
<td>76</td>
</tr>
<tr>
<td>8</td>
<td>Bulldozer</td>
<td>T140</td>
<td>5</td>
<td>86</td>
</tr>
<tr>
<td>9</td>
<td>Rubber-tyred hydraulic excavator</td>
<td>W4-60C</td>
<td>5</td>
<td>84</td>
</tr>
<tr>
<td>10</td>
<td>Generator unit (2 sets)</td>
<td>FKV-75</td>
<td>1</td>
<td>98</td>
</tr>
<tr>
<td>11</td>
<td>Impact type well drill</td>
<td>JZC350</td>
<td>1</td>
<td>87</td>
</tr>
<tr>
<td>12</td>
<td>Cone-shaped and reverse discharging concrete mixer</td>
<td>JZC350</td>
<td>1</td>
<td>79</td>
</tr>
</tbody>
</table>
The noise influence prediction results of main construction machinery in full-load operation status during the construction period, at different distance, is worked out with the above formula as per the full-load and single-machine noise level of construction machinery in Table 5-1, as shown in Table 5-2.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Type of machine</th>
<th>Distance from the construction (m)</th>
<th>5</th>
<th>10</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>150</th>
<th>200</th>
<th>300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wheel loader</td>
<td>90  84  78  72  69  66  65  61  58  55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wheel loader</td>
<td>90  84  78  72  69  66  65  61  58  55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Land leveler</td>
<td>90  84  78  72  69  66  65  61  58  55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Vibrating roller</td>
<td>86  80  74  68  65  62  61  57  54  51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Double-wheel and double-vibration roller</td>
<td>81  75  69  63  60  57  55  52  49  46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Three-wheel roller</td>
<td>81  75  69  63  60  57  55  52  49  46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pneumatic tyre roller</td>
<td>76  70  64  58  55  52  50  47  44  41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bulldozer</td>
<td>86  80  74  68  65  62  61  57  54  51</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Rubber-tyred hydraulic excavator</td>
<td>84  78  72  66  63  60  59  55  52  49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Generator unit (2 sets)</td>
<td>84  78  72  66  63  60  59  55  52  49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Impact type well drill</td>
<td>73  67  61  55  52  49  47  44  41  38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Reverse discharging blender</td>
<td>65  59  53  47  44  41  39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: the real noise value is measured at the 5m distance.

**5.3.1.3 Impact analysis**

(1) The noise of single construction machinery shall reach the standard limit requirement at the max distance 30m away from the source in the day and shall reach the standard limit requirement at the max distance 300m away from the source in the night.

(2) The noise of various construction machines shall reach the standard limit requirement at the max distance 60m away from the source in the day and shall reach the standard limit requirement at the max distance 350m away from the source in the night.

(3) The environment protection targets within the assessment range of intended project mainly include 6 residential areas, 1 nursing home and 1 heath center. The day construction of this Project can cause the interference to the residents and the patients. The noise influence in the night is worse. During the construction period, it shall attach importance to the noise pollution and influence to the residents within 60m of the project construction area and the protection & management measures. As a result, it is believed by the assessment that the protective measures shall be taken, as the wood sound barrier and the sound-isolation construction wall, so as to reduce the influence to the sensitive points of the project areas during the construction period as much as possible. Assessment requirement: the night construction is forbidden in this Project. During the
day construction, the construction containment shall be provided for the sensitive point to effectively isolate the sound.

5.3.2 Noise influence prediction during operation period

The noise influence during the operation period of this Project mainly comes from the road and bridge works and the water supply works (water purification plant). The bridge works of this Project mainly refer to the vehicular bridges, including the Huaxi River major bridge and the Yangliu River medium bridge. The Yangliu River medium bridge is part of the A1 road. The Huaxi River major bridge and the Yangliu River medium bridge, as the vehicular bridges connecting the east and the west of Liujiang Town, vary a little in the traffic flow. Thus, no individual prediction is made to the bridge works in this assessment. The prediction result of A1 road is used as the reference. The detailed noise influence analysis during the operation period of this Project is as follows:

5.3.2.1 Road works

(I) Prediction parameter

1. Traffic volume

According to the feasibility research report of this Project and the similar road works, the prediction result of traffic volume is shown in Table 5-3. The characteristic prediction years include the years 2016, 2023 and 2033:

<table>
<thead>
<tr>
<th>Item</th>
<th>Flow capacity of 2016</th>
<th>Flow capacity of 2023</th>
<th>Flow capacity of 2033</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 (new section)</td>
<td>116</td>
<td>276</td>
<td>380</td>
</tr>
<tr>
<td>North A2</td>
<td>124</td>
<td>297</td>
<td>398</td>
</tr>
</tbody>
</table>

2. Vehicle type ratio and daytime-nighttime ratio

According to the feasibility result of this Project, the traffic flow, the vehicle type ratio and the daytime-nighttime ratio of each prediction year are shown in Table 5-4.

<table>
<thead>
<tr>
<th>Prediction year</th>
<th>Flow capacity of 2016</th>
<th>Flow capacity of 2023</th>
<th>Flow capacity of 2033</th>
<th>Daytime-nighttime ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small car</td>
<td>73.9</td>
<td>15.6</td>
<td>10.5</td>
<td>8:1</td>
</tr>
<tr>
<td>Medium-sized car</td>
<td>76.3</td>
<td>12.2</td>
<td>11.5</td>
<td></td>
</tr>
<tr>
<td>Large car</td>
<td>77.3</td>
<td>10.6</td>
<td>12.1</td>
<td></td>
</tr>
</tbody>
</table>

3. Traffic flow

The absolute traffic flow (set/h) of this road can be calculated as per the traffic flow (pcu/d) of prediction year, the vehicle type ratio and the daytime-nighttime ratio, as shown in Table 5-5.
Table 5-5 Prediction Result of Traffic Flow (unit: set/h)

<table>
<thead>
<tr>
<th>Name</th>
<th>Daytime/Nighttime</th>
<th>2016</th>
<th>2023</th>
<th>2033</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Small car</td>
<td>Medium-sized car</td>
<td>Large car</td>
</tr>
<tr>
<td>A1 (new section)</td>
<td>Daytime</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Nighttime</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>North A2</td>
<td>Daytime</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Nighttime</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(III) Noise prediction and calculation

(1) Determination of calculation point

The two roadways of this Project include the A1 road and the North A1 road. 3 sensitive points are located around the two roadways, including 1 hospital and 2 residential areas. The details of calculation parameter are shown in Table 5-6 below:

Table 5-6 Prediction Point Calculation Parameter of Road Works

<table>
<thead>
<tr>
<th>Road</th>
<th>Name of sensitive point</th>
<th>Town</th>
<th>Distance to the center line of road (m)</th>
<th>Current noise level* (dBA)</th>
<th>Environmental profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road A1</td>
<td>Liujiang Town Central Public Health Center</td>
<td>Liujiang Town</td>
<td>North of the road, 16m</td>
<td>53.4</td>
<td>50 beds</td>
</tr>
<tr>
<td></td>
<td>Residents of Liuba area</td>
<td>Liujiang Town</td>
<td>South of the road, 26m</td>
<td>51.0</td>
<td>About 25 households</td>
</tr>
<tr>
<td></td>
<td>(Hongxing Village)</td>
<td></td>
<td></td>
<td></td>
<td>80 persons</td>
</tr>
<tr>
<td>North A2</td>
<td>Residents of Shuanghe Village</td>
<td>Liujiang Town</td>
<td>East of the road, 21m</td>
<td>51.8</td>
<td>About 22 households</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>About 60 persons</td>
</tr>
</tbody>
</table>

Remark: the current noise level is the average value of the two-day monitoring values.

(2) Assessment standard

The assessment for both sides of the road of the road works shall follow the class 2 standard.

(3) Calculation result

It is assumed that the subgrade of each typical road section is 0m. The shield and screening influence caused by the front building and the tree and the terrain change are not considered. The prediction result of each typical road section is shown in Table 5-7.

Table 5-7-1 Road Prediction Result (A1)

<table>
<thead>
<tr>
<th>Operation period</th>
<th>Time</th>
<th>Predicted traffic noise at different distance from the road center line dB (A)</th>
<th>Standard distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2016</td>
<td>Class 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Daytime</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>49.3</td>
</tr>
</tbody>
</table>
Table 5-7-2 Road Prediction Result (North A2)

<table>
<thead>
<tr>
<th>Operation period</th>
<th>Time</th>
<th>Predicted traffic noise at different distance from the road center line dB (A)</th>
<th>Standard distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>2016</td>
<td>DAYTIME</td>
<td>48.5</td>
<td>46.9</td>
</tr>
<tr>
<td></td>
<td>NIGHTTIME</td>
<td>43.1</td>
<td>40.0</td>
</tr>
<tr>
<td>2023</td>
<td>DAYTIME</td>
<td>50.5</td>
<td>48.6</td>
</tr>
<tr>
<td></td>
<td>NIGHTTIME</td>
<td>44.8</td>
<td>41.8</td>
</tr>
<tr>
<td>2033</td>
<td>DAYTIME</td>
<td>52.5</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>NIGHTTIME</td>
<td>45.5</td>
<td>42.5</td>
</tr>
</tbody>
</table>

(IV) Prediction result of sensitive point

According to the noise prediction mode and the prediction parameter and in combination with the real project conditions, the prediction noise value at different distance from the line and the noise prediction result of sensitive point are shown in Table 5-8.

Table 5-8 Prediction Noise Result of Sensitive Point

<table>
<thead>
<tr>
<th>Name of sensitive point</th>
<th>Road</th>
<th>Location relation (m)</th>
<th>Time</th>
<th>Background value (dB)</th>
<th>Prediction of ambient noise (dB)</th>
<th>Superscale (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Distance from the road center line</td>
<td>Height difference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liujiang Town Central Public Health Center</td>
<td>North A1 road</td>
<td>16</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residents of Liuba area (Hongxing Village)</td>
<td>South A1 road</td>
<td>26</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residents of Shuanghe Village</td>
<td>East of North A2 Road</td>
<td>21</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(v) Analysis of prediction result

1. Standard distance

It is seen from Table 5-8 that the intended project road shall reach the class 2 standard distance limit and the details are as follows:

The class 2 standard limit in Environmental Quality Standards for Noise (GB3096-2008) can be reached when both sides of the road is 20m away from the center line.
2. Influence analysis for sensitive point

The environment protection targets during the operation period of road works of this Project mainly include the Central Public Health Centers of Liujiang Town and the residents in Liuba and Shuanghe Village. The requirement class 2 standard area shall be followed. The influences to the three sensitive points, caused by the road works of the Project, are as specified below in details:

The day and night noise level of the three sensitive points can meet the class 2 standard limit requirement in Environmental Quality Standards for Noise (GB3096-2008) in the recent operation period (2016), mid-term operation period (2023) and future operation period (2030) of intended road in this Project. No standards are exceeded.

(VI) Traffic noise pollution reduction measures, planning and suggestion

1. Reasonable planning, architectural composition and control of lands on both sides of highway

In principle, the school, the hospital, the centralized residential blocks and other sensitive buildings shall not be set up or expanded within the noise protection area. It is suggested that when the lands on both sides of the road are reasonably planned, the architectural composition and the sound isolation design shall be stressed to ensure that the indoor environment of sensitive building can meet the functional requirements. It is known from the general plan of Liujiang Town that the commercial areas and a few commercial-residential areas are mainly located around the project roadway. Thus, it is specified in the assessment requirement that the market, the dinning places and other commercial building can be located on both sides of the road to reduce the influence to the residents caused by the traffic noise. Meanwhile, the environment-sensitive architectural composition is optimized. The noise-sensitive functional areas shall be arranged at the side far away from the road.

As a result, on the basis of the noise prediction result, it is suggested by the environmental assessment that the school, the hospital, the gerocomium, the residential area and other sensitive buildings shall not be set up on both sides which are 20m from the road center line. In case the sensitive points of acoustic environment are arranged within the above range, the noise reduction measures must be made in the construction process and such measures shall be put into service when passing the acceptance of the environment authority and reaching corresponding functional standard.

2. Treatment measure and scheme for noise pollution

The day and night noise level of the three sensitive points of Liujiang Town Subproject can meet the class 2 standard limit requirement in Environmental Quality Standards for Noise in the recent operation period (2016), mid-term operation period (2023) and future operation period
(2030) of intended road in this Project. No standards are exceeded. Relevant management requirements are proposed in the environment assessment that once the road is completed and put into service, the traffic control shall be stressed to avoid the over-standard noise caused by the traffic jam. The vehicle noise monitoring shall be stressed, the vehicle exceeding the noise standard shall be controlled and speeding is forbidden.

5.3.2.2 Water supply work (water purification plant)

Noise sources of water purification plant work of Liujiang Town Subproject mainly refer to noise of water pump equipment in water intake pumping house and equipment noise generated by blower. See Table 5-9 for generation and treatment situations of project noises.

<p>| Table 5-9 List of Generation and Treatment Situations of Project Noises |
|-----------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>Name of Equipment</th>
<th>Working Situation</th>
<th>Sound Pressure Level dB (A)</th>
<th>Treatment Measure</th>
<th>Sound Pressure Level after Treatment dB (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water pump</td>
<td>Continuous</td>
<td>85</td>
<td>Reasonable layout, sound insulation door and window</td>
<td>≤70</td>
</tr>
<tr>
<td>Air blower</td>
<td>Continuous</td>
<td>80</td>
<td>Reasonable layout, vibration reduction</td>
<td>≤65</td>
</tr>
</tbody>
</table>

This Assessment predicates factory boundary noise and environmental noises at the environmental sensitivity points within the scope of 100m after the project construction is completed. See Table 5-4 for predicated source strength and predicated point distance, and see Table 5-5 for predicated results.

| Table 5-10 Predicated Source Strength and Predicated Point Distance of the Project |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Sound Source    | Sound Level after Treatment dB (A) | Factory Boundary East | Factory Boundary South | Factory Boundary West | Factory Boundary North |
| Water pump      | ≤70              | 37.9            | 37.7            | 41.1            | 36.0             |
| Air blower      | ≤65              | 33.2            | 32.9            | 36.7            | 32.5             |

Table 5-11 Predicated Results of Project Noise

<table>
<thead>
<tr>
<th>Item</th>
<th>Factory Boundary East</th>
<th>Factory Boundary South</th>
<th>Factory Boundary West</th>
<th>Factory Boundary North</th>
<th>Sensitivity Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background noise dB (A)</td>
<td>Daytime</td>
<td>49.7</td>
<td>48.5</td>
<td>49.1</td>
<td>49.0</td>
</tr>
<tr>
<td></td>
<td>Nighttime</td>
<td>43.5</td>
<td>43.0</td>
<td>43.1</td>
<td>43.5</td>
</tr>
<tr>
<td>Contribution value dB (A)</td>
<td>Daytime</td>
<td>42.4</td>
<td>38.9</td>
<td>39.1</td>
<td>37.6</td>
</tr>
<tr>
<td></td>
<td>Nighttime</td>
<td>42.4</td>
<td>38.9</td>
<td>39.1</td>
<td>37.6</td>
</tr>
</tbody>
</table>

Note: The background value of noise current status takes mean value of 2-day monitoring values.
According to above Table, it can be known that the contribution values of equipment noise during the operation period of water purification plant to all factory boundaries can reach the second-class standard limited values in *Emission Standard for Industrial Enterprises Noise at Boundary* (GB12348-2008). The predicted value at project sensitivity point is 51.2dB (A) in the daytime and 43.4dB (A) in the nighttime, which can reach the second-class standard limited value in *Environmental Quality Standards for Noise* (GB3096-2008). The project has little impact on sound environmental sensitivity points.

5.3.2.3 Newly built ecological parking lot

The noise during the operation period of ecological parking lot refers to noise of vehicles entering and leaving the parking lot, which belongs to low noise; in this case, it is required to strengthen management to parking lot with no horn; adopt speed limit and no horn or other management measures to vehicles entering and leaving the parking lot. This kind of noise will not bring obvious impact on acoustic environment of project area.

5.4 Water Environmental Impact Assessment

5.4.1 Analysis on surface water environmental impact during the construction period

5.4.1.1 Analysis on impact of project construction wastewater on ground surface water environment

The wastewater sources during the construction period of this project mainly refer to project construction wastewater and domestic sewage; wherein, project construction wastewater includes cooling water and cleaning water for construction machinery, as well as water for cleaning construction site and building materials and for concrete pouring, curing and cleaning. This part of wastewater contains a certain amount of sediment. Domestic sewage of construction personnel mainly includes organic pollutant, ammonia nitrogen and SS. In addition, the ground surface runoff on the operating faces in rainy season includes a certain amount of soil and high-concentration suspending substances.

(1) Domestic sewage and countermeasure

During the construction peak period, there are 100 construction personnel and management personnel in total on the construction site. In case of calculating as per 50L/person · d, the water consumption amount is 5m³/d, and in case of calculating drainage coefficient of domestic sewage as per 0.8, the domestic sewage amount during the project construction period is 4m³/d. The
domestic sewage during the project construction can be treated by utilizing existing facilities in rented local houses.

Therefore, domestic sewage during the construction period will not bring obvious impact on local environment.

(2) Project construction wastewater and countermeasure

Main pollutant of project construction wastewater and ground surface runoff in rainy season is sediment, the concentration of suspending substances is relatively high, and the pH value is weakly alkaline. Construct sedimentation tank to separate suspending substances away, and wastewater can be recycled after sedimentation treatment without being drained; dredge settled sludge regularly, and then transport it to building rubbish site for landfill disposal.

5.4.1.2 Analysis on impact of project construction method on ground surface water environment

1. Hongchuan Town – river channel regulation work

The impact of river channel regulation work of this project on water environment mainly comes from river channel dredging and river embankment construction. During the dredging work of city moat of Hongchuan Town, the water body will be disturbed, thus generating suspending substances and impacting water quality. However, this project adopts staging method to conduct dredging, and the construction time is relatively short, so the impact is temporary, and the impact will disappear after the project is completed. In addition, dredging work adopts cofferdam construction process, except disturbance to riverbed during the cofferdam construction, other construction procedures are to be conducted within the cofferdam, so as to avoid sludge excavation in rainy season, thus basically guaranteeing that construction process and water body are separated; moreover, the water body functions of river channel are flood discharge and irrigation, so the impact of project construction on water quality of river channel water body is relatively small. The river embankment construction work of this project adopts staging for implementation, construction materials are stacked far away from river channel, and the clapboard is to be arranged between construction river reach and river channel, so as to avoid impact on water quality and water body functions due to sliding of embankment materials.

Therefore, after adopting above measures, the river channel dredging and river embankment construction methods of this project are reasonable, the water body functions of city moat of Hongchuan Town will not be changed, and the impact on water environment is relatively small.

2. Liujiang Town – Bridge work
The bridge work of this project does not involve setting of wading bridge pier, so during the whole construction of bridge pier, there is no wading work. However, in the project, the bridge pier adopts pile foundation, and all pile foundations of bridge piers all adopt drilling construction. Both the cushion cap and the pier body adopt cast-in-situ method, so when they are scoured by rainwater, some suspending substances may be brought into ground surface water body, but this impact is relatively small. The Assessment suggests that in rainy day, the construction of pile foundation of bridge pier should be avoided to the greatest extent, so as to reduce the increasing rate of suspended substances in ground surface water that is caused by scouring of rainwater. In addition, the upper structure of main bridge in this project adopts the lifting method of precast concrete member for installation, so the construction of upper structure of main bridge of this project basically will not generate pollution impact on water environment. The upper structure of the approach bridge adopts precast concrete member, so the construction has no impact on water body basically.

5.4.1.3 Analysis on impact of transportation and stacking of project construction materials on ground surface water environment

The river channel regulation of this project and transportation of building materials of bridge work all may cause dust flying, and the dust will fall into regional water body with wind, thus generating a certain impact on water body. Therefore, during the material transportation in gale day, it is necessary to cover the materials, so as to prevent the fallen materials from being scoured by rainwater thus causing water body pollution.

In addition, the stacking of construction materials such as asphalt and oil shall be managed properly, and shall be covered if necessary, thus preventing them from being scoured by rainwater and entering water body, which may cause water environment pollution. Therefore, during the construction, it is necessary to strengthen protection and management measures in a targeting way according to different building materials and characteristics, so as to reduce impact on water environment to the greatest extent.

5.4.1.4 Analysis on impact of project construction on drinking water source of ground surface water and aquatic organism

Main rivers involved in this project include city moat of Hongchuan Town, Huaxi River and Yangliu River of Liujiang Town, with main water body functions of irrigation and flood discharge. As the water body where the water intake point of water intake work is located this time, Yangcun River possesses the function of drinking water source. However, through investigation, it is known that the proposed water intake point in Yangcun River is located upstream from Yangcun River,
where is not in main town region of Liujiang Town. Within the scope of 10km downstream from river channel regulation and bridge construction work region of the project, there is no centralized water intakes of ground surface drinking water. In the water area assessment scope of construction region of this project, there is only a small amount of plankton without any fish or rare aquatic organism. The river reach dredging during the project construction will disturb water body, thus generating a certain amount of suspending substances, thus causing a certain impact on plankton. However, this project adopts staging construction, and this will not cause cutoff of water body; moreover, the construction impact is temporary and will disappear after the construction is completed. Therefore, the construction of this project will not impact regional drinking water source, and will only have a relatively small impact on aquatic organism in river reaches involving reconstruction and bridge construction.

5.4.2 Analysis on impact of operation on ground surface water environment

The impact on ground surface water during the operation of this project mainly originates from the new road, bridge works and water supply works. The detailed impact analysis is shown below:

1. Road and bridge works

The sewage during the operation period of proposed road of this project mainly comes from precipitation, and pavement runoff generated by pavement scouring. After road and bridge are put into operation, the pavement rainwater runoff will be main pollutant, and its impact on water environment is mainly shown as below: automobile exhaust, tire friction particles, pavement flying dust and dropped oil flow into nearby and crossing river bodies with pavement rainwater, thus polluting the water body. The concentration of pavement runoff pollutant depends on rainfall amount and rainfall time, traffic volume and atmospheric pollution degree, time interval between two rainfalls, pavement width and many other factors, with strong randomness and large contingency, so it is very difficult to work out general law and uniform estimation method for calculating concentration of rainfall runoff pollutant. According to statistics of domestic research data and assessment data, the pollution of pavement runoff on water body mainly occurs at the beginning of rainfall, with the extension of rainfall time, the content of pollutant in runoff will reduce, and the pollution on water body will also reduce, so there will be no obvious impact on water body.

After the project is completed, the pavement will adopt the structure with relatively strong
water permeability. Under the non-accident status, the pavement runoff sewage may be close to national drainage standard basically, and will not cause pollution impact on environment. However, if the automobile maintenance status is poor, and there is fault or accident, gasoline and engine oil may leak and pollute the pavement. In case of meeting rainfall, rainwater will flow into municipal sewage pipe network through spillway, thus causing petroleum and COD pollution impact. In this case, it is necessary to adopt traffic management measures to avoid occurrence of similar accident and reduce impact of accident wastewater on regional ground surface runoff.

2. Water supply work

(1) Production wastewater

Production wastewater during the operation period of the new water purification plant of Liujiang Town Subproject mainly comes from sludge water of sedimentation tank and backwashing wastewater of filtering tank. Backwashing wastewater is usually recycled by recovery tank for treatment, without being drained; sludge water will be treated, so as to make supernatant reach up-to-standard drainage, and the supernatant will be drained into nearby flood discharge ditch.

(2) Office domestic sewage

After the project is put into operation, there will be 11 employees, who will implement the four-team-three-shift working system. There is no mess hall in the plant, and there is only a little domestic sewage from office zone. Each day, there will be 1.1m³ domestic and office sewage, and the sewage will be transported to local sewage treatment plant by tank truck for treatment and drainage.

Liujiang Town is planning to construct 1 sewage treatment plant with the treatment capacity of 7000m³/d, which will be located at Shuixin Temple on the north side of the town area. This project is now under construction. After being constructed, the sewage treatment plant will be able to meet the drainage requirements of the project.

After adopting above measures, the impact of water supply work of this project on regional ground surface water environment will not be obvious.

5.5 Atmospheric environmental impact assessment

5.5.1 Analysis of atmospheric environmental impact during construction

5.5.1.1 Construction dust

1. Pollution source analysis
Fugitive dust generated by construction vehicles during the construction period, which is falling dust with small particle size (10 – 20μm), may cause severe pollution and a large scope of influence. As for (soil) dust over the unpaved road surface, that with particle size of below 5μm, 5–30μm and above 30μm accounts for 8%, 24% and 68% respectively. Therefore, fugitive dust is easily generated over a road being constructed, but it is less harmful and has a shorter influence period than dust generated during lime-soil mixing. Fugitive dust pollution can be reduced by watering.

Earth & rock excavation and earthfill works are the major construction works where fugitive dust is generated. A large quantity of dust may be generated during lime-soil mixing in the process of road construction. There are two mixing processes, i.e. road mixing, where mixing is conducted on the construction site, and plant mixing, where central mix is adopted and finished products are transported by vehicle to the construction section. By contrast, plant mixing has larger and wider influence, its pollution scope extending up to 150m in the downwind direction while road mixing has a longer route of pollution. Hence, a proper lime-soil mixing process shall be selected according to practical situation during the construction period so as to reduce TSP pollution.

2. Control measures for fugitive dust pollution

(1) In case of winds of Beaufort force IV where fugitive dust is easily generated, it is recommended that the construction unit stop earth excavation and take effective measures such as covering and wetting the piled materials to reduce fugitive dust pollution;

(2) Collect and carry away construction wastes in time if possible or cover them if not possible temporarily. Vehicles carrying sand, stone, cement, earth and other materials that generate dust easily must be strictly enclosed to prevent leakage.

(3) Clean the construction site upon completion of construction, and afforest or recover it to an arable land for crop planting.

(4) Select a proper lime-soil mixing method according to practical situation and reduce fugitive dust pollution by watering.

(5) During excavation, drilling and demolition, keep the air moist by watering; wet the dry and cracked surface soil at the construction site by watering at regular intervals to prevent dust generation; during earth backfill, wet the dry surface soil by watering to prevent dust emission.

(6) Strengthen the management of stacking site for earth backfill and develop measures such as surface compaction, regular water spraying and covering; unnecessary soil and construction wastes shall be carried away in time.

(7) Earth-moving trucks and construction material carriers shall be equipped with a spill-proof device and shall not be excessively loaded, thus preventing spill during transportation;
the running route and time of transport vehicles shall be properly planned, and running in
downtown, traffic concentrated, residential and other sensitive areas shall be avoided to the
greatest extent.

(8) Canopy transport vehicles and rinse them thoroughly before loading and unloading at site
to prevent soil on wheels and chassis falling onto the road.
(9) Soil falling onto the road during transportation shall be cleared away timely to reduce
fugitive dust generation.

(10) It is forbidden to use waste construction materials as fuel during construction.

5.5.1.2 Waste gas of construction
Waste gas during the construction period of this Project mainly refers to exhaust gas
generated discontinuously and dispersedly from construction machineries and transport vehicles
with a small quantity whose influence can almost be omitted.

5.5.1.3 Asphalt fume
During pavement construction of the proposed road of this Project, asphalt fume is mainly
generated in the process of asphalt refining, mixing and road surfacing. And the highest emission
comes from asphalt refining. Main toxic and harmful substances contained in asphalt fume are
THC, phenol and 3.4-benzopyrene. The pollution scope of asphalt fume can extend up to 100m in
the downwind direction. Asphalt required for this Project is finished asphalt purchased locally, so
no asphalt mixing plant will be set up. According to the environmental assessment, asphalt shall be
transported in tanks by a special purpose vehicle to prevent leakage pollution. It shows that the
emission concentration of asphalt fume is relatively low, below the highest allowed value as
specified in Integrated Emission Standard of Air Pollutants (GB16297-1996) and with a smaller
impact on ambient environment.

5.5.1.4 Temporary sludge stockpiling
Temporary sludge stockpiling required in desilting works during the construction period may
produce foul smell and affect the air quality of the regional environment. According to the
environmental assessment, it is required that temporarily stockpiled sludge be carried away as
soon as possible after treatment and the construction party spray disinfectant and plant liquid all
around the stockpiling yard to reduce odor pollution. In addition, the stockpiling yard shall be far
away from the residential area to prevent influence of foul smell on residents.

In conclusion, the foul smell from sludge stockpiling during the project construction period
has a relatively small impact on the regional environment.
5.5.2 Analysis of atmospheric environmental impact during operation

5.5.2.1 Road and bridge works
After implementation of Liujiang Town Subproject, fugitive dust pollution of road and bridge works will decrease, but during the operation period, fugitive dust and tail gas generated by running vehicles, with CO, NOx and PM$_{10}$ as major pollutants, may still cause air pollution. The quantity of pollutant discharged increases in proportion with the traffic volume and relates to the type and running conditions of vehicles. The influence of pollutants such as NO$_2$ in tail gas of vehicles will grow with the increasing traffic volume. Based on an analogy with similar roads, it can be predicted that under the maximum traffic volume at a specified future date, the daily average concentration of NO$_2$ and PM$_{10}$ 20m from the road axis can meet the Class II standard of Ambient Air Quality Standards.

The recommended measures to reduce air pollution during the operation period of road and bridge works of this Project are shown as follows:

1. Strengthen greening measures, optimizing greening tree species, greening structure and level to improve greening effect and reduce influence of gaseous pollutants on ambient environment.
2. Strengthen traffic management such as specifying a range of driving speed to reduce accidents.
3. Conduct watering and cleaning at regular time to reduce fugitive dust.
4. Put limits on driving speed in strict compliance with the specified speed of this Project.
5. Strictly prohibit the passage of vehicles carrying dangerous goods.

5.5.2.2 Newly constructed ecological parking lot
During the operation period of the new ecological parking lot of Liujiang Town Subproject, exhaust pollutants mainly refer to tail gas of vehicles coming in and going out of the parking lot which contains CO, NO$_2$ and HC. The emission volume of tail gas relates to the use frequency of the parking lot and the number of vehicles. The ecological parking lot with an open terrain for ground parking and a high green coverage is beneficial to diffusion of tail gas from motor vehicles, thus reducing the influence of tail gas on environment.

5.6 Solid Waste Environmental Impact Assessment

5.6.1 Impact analysis of the solid waste generated during construction period
The solid waste generated during construction period of the Project consists primarily of two parts. One part is the waste produced in construction areas, including discarded building materials, packing materials, domestic waste, etc. mainly in the form of waste plastics, sandy soil, vegetable
leaves and stems, glass, etc. Such solid waste is frequently present in the vicinity of such structures as a storage yard and a construction site. The other part is the sludge produced during river channel dredging. Such solid waste is primarily present in a temporary storage yard. A heavy metal testing will be conducted on the sludge. After tested not in excess of the required level and drained, a portion of it will be used for backfilling and spreading the planting soil for wetland landscape within the Hongchuan project area and landscape molding, and the rest of it will be used as planting soil for landscaping and greening of the urban road construction in Hongya County.

Improper stacking and mishandling of solid waste will result in direct damage to crops and vegetation, and impede agricultural production. When catching the wind, the sludge storied for a long time will be liable to produce fugitive dust and thus impact the neighboring residents; when stacked along the road, it will also cause mass breeding of bacteria, mosquitoes and flies, thus leading to a high incidence and easy transmission of local infectious diseases, and the unpleasant smell it generates will influence residents’ daily life and environmental landscape. The Project involves construction adjacent to the river, so the environmental assessment requires that the solid waste generated during construction period shall not be stacked in the vicinity of the project-related water bodies, and shall not be discarded in the river. Hence such impact may be reduced and avoided by strengthening construction management during construction period, and performing a timely removal and disposal of the solid waste after completion.

Additionally, it will have a negative impact on the surroundings when the solid waste produced during construction period is transferred in an improper way, and in this case the environmental assessment requires that while the construction waste is being transferred at a loading area, the vehicles used must be covered with a dust screen to prevent the waste from falling and producing fugitive dust on the way, and they shall also be washed; when reaching an unloading area, the vehicles must be completely dumped; the construction company shall work jointly with transportation and environmental protection departments, conducting a conscientious research on such a transport route of spoil and waste that averts from environmentally sensitive points such as centralized neighborhoods. And the solid waste shall be transferred preferably at nights.

When the above measures are taken, the solid waste generated during construction period will have a lesser impact on the surrounding environment.

5.6.2 Impact analysis of the solid waste generated during operation period

5.6.2.1 Road and bridge works

The solid waste generated during operation period is primarily domestic waste produced by management personnel and maintenance workers, and as such waste is distributed in a point-like
way throughout the project area, it has a lesser impact on the environment when compared with the solid waste produced during construction period; since the solid waste generated during operation period is present in the immediate vicinity of the road and thus is closely related to a person’s life, if not disposed properly, it will influence the landscape, pollute the air, transmit diseases and even endanger human health. During operation period, it is required to collect, stack, clear and transport domestic waste in a proper manner, in a bid to prevent it from being piled up or littered at will to impact environmental hygiene. The solid waste generated during the operation period of road and bridge works of the Project is required to be cleared and transported by sanitation department, and disposed at the local refuse disposal plant.

5.6.2.2 Water supply works (water purification plant)

The solid waste generated at production area of the water purification plant includes dried sludge and office and domestic waste. The output of dried sludge of the Project is approximately 1.4t/d. The plant has about 11 production personnel, and if each person produces 0.5kg of office and domestic waste every day, the output of office and domestic waste is roughly 5.5kg/d.

Disposal measures: the dried sludge will be transported to a landfill for disposal; the office and domestic waste will be collected in a centralized way and disposed by the local sanitation department.

5.7 Environmental Risk Impact Assessment

After the Project is completed, environmental risks mainly originate from the water purification plant of water supply works, and road and bridge works. Chlorine dioxide will be used as a disinfectant for water purification plant. The environmental risks during operation period of the Project are primarily harm to human beings due to chemical spill and improper water treatment. The main function of road and bridge works is for urban traffic. The environmental risks during road service mainly come from sudden leakage of hazardous substances such as chemical fertilizers and pesticides during transportation, and in case of such accident, a certain area of malignant pollution will be caused at a short time, thus doing some harm to the local environment.

5.7.1 Environmental risk prevention measures

1. Water supply works (water purification plant)

   Risk prevention measures for water sources:
   (1) Set up a reporting system for environmental accidents throughout the drainage basin;
   (2) Establish an emergency monitoring system and develop an emergency monitoring scheme in a rational way;
   (3) Conduct a real-time tracking and monitoring on water quality and effluent concentration of
water sources, and adjust the treatment process of water purification plant according to the monitored water quality;

(4) Terminate water supply if effluent quality cannot meet drinking water requirements, inform the public in the name of the government and use backup water sources;

(5) Perform a tracking and monitoring on water quality, and provide additional necessary treatment measures, in order to resume water supply as soon as possible;

(6) Inform the public of the water quality shortly after the water supply reaches the required standard, and resume water supply.

**Risk prevention measures for water purification plant and pipe network:**

(1) Furnish the disinfection room with an exhaust fan to avoid local accumulation of ClO$_2$ through ventilation, and install such an alarm system that sets off when the level of ClO$_2$ exceeds the threshold, in order to prevent a potential explosion.

(2) Authorize a professional organization to transport chemicals.

(3) The project owner shall strengthen management and inspection on concealed works such as pipe network during construction period, so as to ensure construction quality.

(4) Report them to the related departments without delay in case of occurrence of any accidents and take effective treatment measures in order to minimize their harm to the surrounding environment.

2. **Road and bridge works**

After the road is completed and open to traffic, the road management department shall strictly implement the provisions specified in the Planning on Road Transport of Dangerous Goods for the危险货物运输车辆 and personnel. It is required to reinforce the management of all links from inspection on the road, en-route transportation and parking to accident handling, prevent and reduce the occurrence of transport accidents, and prevent sudden accidents and situation from escalating.

(1) Strengthen vehicle management and inspection to ensure that the vehicles running on the road are in good condition.

(2) Establish relevant rules and regulations to exercise a strict restriction on the hazardous chemicals-borne vehicles running on the road of the Project.

(3) Set the speed limit for the vehicles traveling in the fog and snow.

(4) Use a variable message sign to alert vehicles drivers to bad weather or dangerous road condition that are liable to cause a traffic accident in order for them to take proactive risk prevention measures such as limiting the driving speed or closing a partial stretch of the road ahead of time.
5.7.2 Environmental risk assessment conclusion

In strict accordance with the standards for hazardous chemicals storage in the water purification plant of the Project, all chemicals are stored in a cool and ventilated chemicals storeroom, and leakage of hazardous chemicals can be prohibited by installing gas collectors in chlorine dioxide and linking to the wastewater emergency pool. Additionally, the proposed road of the Project as an urban branch road has a very low accident incidence as it is relatively short in length with a low traffic volume, and thus the risk of the accident can be minimized by taking relevant preventative measures. The proposed road has no function of transporting hazardous chemicals, and therefore hazardous chemicals-borne vehicles are not allowed to travel on the road during operation period, which prevents such chemicals from causing risks to the road. In conclusion, the implementation of the Project is feasible from the point of view of above environmental risk analysis.
6.0 Water and Soil Conservation

For details on the water and soil conservation of the Project, refer to Water and Soil Conservation Scheme (Annex 5).
7.0 Resettlement Plan

The Resettlement Plan is prepared by Sichuan Fontal Strategic-Consulting Co., Ltd. for the Project. See Annex 6 for details.
8.0 Public Consultation

Public consultation forms an integral part of environmental impact assessment of a construction project and is a two-way communication between the project owner, the assessment unit and the masses. Through public consultation, the environmental issues concerned by the public can be better understood so that the relevant departments may formulate practical and feasible environmental protection measures to ensure the realization of good social and economic benefits for the Project.

Implementation of the project can not only improve local transport and landscape ecological environment, promote the mobility of people, materials and information within the area and boost the economic development of Hongya County, but also generate influences on the production, living, traveling, communication and other aspects of the masses to varying degrees. The project owner and assessment unit have solicited opinions and suggestions from relevant departments and residents in the project area on construction of the project, especially on environmental protection of the Project, in the design and assessment processes by visiting, online publicity, distributing questionnaires or by other means according to requirements of the Law of the People’s Republic of China on Environmental Impact Assessment and in line with the principle of “putting people first and building a harmonious society”.

8.1 Purpose of public consultation

(1) To disclose the construction purpose, scale, site and other basic information of the Project, as well as environmental impacts that may be generated in and after project construction and countermeasures to be adopted to the public, to win their full understanding, support and cooperation. The public have the right to know about the Project and to freely express their views and opinions.

(2) To help analyze regional environmental pollution characteristics and the current quality of environmental factors by consulting local people for their personal experience and direct feeling, so as to improve the objectiveness in environmental impact assessment and protect the vital interests of the public.

(3) To put forward more effective and feasible environmental protection measures since the public are relatively more familiar with the natural environmental, social and economic resources, as well as production and living elements covered by environmental impact assessment;

(4) To realize social and environmental benefits while giving full play to economic benefits of
the Project in a harmonious manner.

8.2 Implementation of public consultation survey

8.2.1 Survey scope and respondents

The scope of public consultation survey covers areas affected directly by the Project, i.e. the moat tail area of Hongchuan Town and Liuba Area of Liujiang Town where the construction site is located. The survey objects comprise affected residents in the project area and personnel in enterprise and public institution in connection with the Project.

8.2.2 Survey content

Contents of the public consultation survey mainly comprise:

1. Public attitude to project construction;
2. Public identification on environmental impacts produced by the Project;
3. Public suggestions and opinions on environmental protection measures to be adopted.

See Annex 12 for the public opinion questionnaire of the project.

8.2.3 Survey method

Public survey of the Project is conducted mainly by distributing questionnaires. In doing so, personnel of the survey team first introduced in details the basic information about the Project, including the project scale, route direction, favorable and unfavorable effects that may possibly be resulted on the local, to the respondent, who then filled in the questionnaire voluntarily or dictated his/her opinions for the surveyor to record while indicating the work unit, home address, gender, age, education background and other information of the respondent. Finally the public questionnaires collected were organized, analyzed and summarized by the environmental impact assessment unit.

To step up the efforts in public survey, we have also done some other works in the process of public consultation; for instance, we carried out field publicity at the project locality and held spot symposium of surrounding residents aiming at the Project, which have all attained good effects.

8.2.4 Survey implementation

(1) Online publicity

In preparation of the environmental impact assessment report, we made the first and the second online publicities for ten work days each on the website of Hongya County People’s Government from March 16 to March 27, 2015 and from April 14 to April 27, 2015 respectively according to the requirements of the Interim Measures for Public Consultation of Environmental Impact Assessment, informing the public that we are responsible for environmental impact assessment of the Project. See Figures 8-1 and 8-2 for the screenshots of online publicity. After the second publicity, we carried out public consultation survey by visiting relevant departments and local residents around the construction site and listened to respondents’ opinions and opinions
carefully after introducing basic information of the Project to them. A total of 100 questionnaires were handed out and filled in the course and 90 effective questionnaires were retrieved, with a recovery rate of 90%.

Figure 8-1 First Online Publicity

Figure 8-2 Second Online Publicity
(2) Public consultation symposium

In the environmental impact assessment, we have also summoned nearby residents and held a public consultation symposium at the meeting room of Liujiang Township Government on June 25, 2015, on which the assessment unit and project owner first introduced basic information of the Project and made explanations on necessity of the Project, favorable effects brought to local economy, traffic and landscape environment, unfavorable effects such as water and soil loss, noise, raising dust pollution that may possibly be resulted in construction and operation periods of the Project and environmental protection measures to be adopted according to the plan, then the environmental impact survey team answered the questions concerned by the public. Through the symposium, the assessment unit and public representatives made adequate and effective communications and exchanged opinions with each other.

Among the surveyed, all believe the river section where the Hongchuan Town Subproject is located suffers a severe ecological environment for the gathering of a large amount sewage and sludge, and the road infrastructure of Liujiang district where the Liujiang Town Subproject is located is also considerably laggard with relatively narrow road surface and poor road conditions; besides, many sections of Liujiang River are dried up, causing serious effects on its natural environment and surrounding environment, which are in urgent need of improvements. In terms of effects that may be generated in project construction, partial respondents believe effects may be produced on their living environment during construction of the Project, while for social effects that will be brought about after completion of the Project, almost all the surveyed believe the Project, upon its completion, will improve their travelling conditions and surrounding environment greatly. Besides, the building of a water treatment plant will ensure clean water supply and bring great convenience to residential drinking, the building of an ecological parking lot will alleviate the parking problem of residents effectively and improve traffic condition of the area. Meanwhile, construction of the Project will also give a boost and drive to the regional economy.
8.3 Statistical analysis on survey results

8.3.1 Composition of respondents

See Annex 12 for the list of respondents involved in the public consultation survey.

8.3.2 Public consultation survey results and analysis

According to the statistics results of random public survey, the following opinions and suggestions were concluded:

(1) Recognition and satisfaction to the current status of local infrastructure

Among the respondents, 68% think the local infrastructure is relatively poor, and the remaining 32% believe it is relatively convenient. It shows to improve local infrastructure condition is still a long-cherished wish of local people.

(2) Attitude to and knowledge on project construction

According to the survey, 100% of the respondents support the construction of the Project without any objection. It shows the Project is totally supported by the local.

(3) Public recognition to current environmental quality of the proposed construction area

10% of the public deem that the current main environmental problem of the proposed construction area is under noise disturbance, 17% believe it is water pollution, 2% - air pollution, 4% - ecological problem, and 68% of the public believe the current environmental quality is good. The above survey results indicate the current environmental quality of the project area is relatively good.

(4) Public suggestions and opinions on environmental measures

51% of the public suggests management during the construction period should be enhanced, 25% believe the adoption of environmental measures could alleviate the adverse environmental effects brought about by project construction, and the other 24% argue for a reasonable layout. It indicates the public hope that greening and management can be strengthened during project construction.

(5) Effects of the proposed project on local environment

According to the public consultation survey, 27% of the public consider noise disturbance the main effect on local environment by the proposed project, 3% - air pollution and 7% - ecological damage. Besides, 1% of the public believe that the project construction will cause impact on water environment and 57% believe that project construction will cause impact on traffic.

Aiming at the above problems, effective noise and raise dust preventive measures should be taken to exercise active control over noise and air pollution in design and implementation of the Project. Meanwhile, land acquisition and resettlement should be done well and effective measures
be adopted to prevent effects on normal regional traffic.

8.3.3. Online publicity survey results

The Project was publicized on the website of Hongya County People’s Government for ten work days for the first time from March 16 to March 27, 2015 and for the second time from April 14 to April 27, 2015. There are no feedback opinions as of April 14, 2015.

8.3.4 Adoption and handling of public opinions

The public consultation survey was carried out in a wide scope, with objects basically covering the main residential areas affected and government institutions concerned, featuring high representativeness of respondents, normative of method and relatively high recovery of public questionnaires. As for opinions raised by the public, the environmental assessment team has reported to and communicated with the Employer in a timely manner and consulted with the Employer, the design department, the project owner and local government department in this regard. Meanwhile, the team has also conducted in-depth analysis on problems of the most concern by the public upon summary on the opinions and requirements by respondents and surveyed units, put forward the principles and primary solution for environmental protection, and fed back to the project owner in time, which has provided handling opinions aiming at these issues and suggestions set forth by the environmental assessment unit.

(1) Emphasis should be laid on environmental impacts caused by project construction, and environmental protection must be done well according to the environmental measures set forth in the environmental impact assessment report.

(2) We will work closely with local cultural relics department in the next stage of design to protect the existing and possible cultural relics along the project route.

(3) The construction unit should sign a civilized construction contract when entering into the project contract, built up a provisional passage before carrying out construction at an intersection with existing roads to prevent traffic congestion and interruption, and meanwhile strengthen the supervision and management of construction team to avoid construction quality problem. When constructing at a river-side road section, side ditches must be dug first and, if necessary, a retaining wall should be built to prevent construction mud, excavation earthwork and wastewater from entering and therefore polluting the water body. Meanwhile enclosures and warning signboards should be set at the construction site.

(4) The project construction department should listen carefully to the opinions of affected residents along the route and reduce cultivated land occupation and damages to agriculture as far as possible.

The public consultation survey was carried out in an open, fair and impartial manner, soliciting
residents’ opinions and reflecting quite a large amount of important information effectively. It is able to reflect the views and opinions of the masses on the Project in the affected area in an effective and reasonable way.
9.0 Environmental Protection Measures and Techno-Economic Feasibility

9.1 Environmental protection measures during design stage

9.1.1 Project design

The project design focuses on rationality of engineering design of linear works such as river improvement, road works, pipe network works, etc., avoiding occupancy of cultivated land and minimizing occupancy and destruction of vegetation. Therefore, route selection of linear works of the Project should follow the following principles in addition to meeting municipal planning:

(1) Make full use of favorable terrain, minimize damage to vegetation, and take necessary engineering measures to reduce land occupancy.

(2) Maintain balance of subgrade earthwork and stonework as far as possible, prepare earthwork borrow scheme, protect the environment and reduce water and soil loss.

(3) Appropriately consider local economic development, contribute to people's production and life, reasonably choose the cross type of road network interface.

(4) Reasonably adopt technical indicators of horizontal and vertical surfaces according the topography, avoid large quantity of filling and excavation, set up traffic signs and service area along the line to ensure the safety of the facilities such as roads, bridges, etc. of the Project.

In general, the proposed works of the project are mostly located in urban areas, resulting in relatively few alternative corridors due to limitation of the terrain conditions. The route selection has fully considered factors such as topography, geology, environmental protection, removal, land occupancy, cultural relics and minerals, construction conditions, etc. of the project area, mainly in combination with regional urban planning, so as to be harmonious with regional planning.

9.1.2 Mitigation measures for social and environmental impact

9.1.2.1 Removal and resettlement work

The Project only involves the permanent acquisition of collective land without removal of rural residential housing, enterprises/institutions, shops, ground attachments and infrastructure. See Annex 6 for resettlement action plan.

9.1.2.2 Preservation of cultural relics

The field survey shows that arrangement of the construction area of the Project steers clear of important cultural relics. According to Article 18, Chapter III of Law of the People's Republic of China on Protection of Cultural Relics, provides that during the large-scale capital construction project, during construction of large-scale construction project, the Project Owner shall first jointly carry out survey or exploration work of cultural relics for the area likely be buried with cultural
relics within the Project area with cultural administration bureau of provinces, autonomous regions and municipalities. There are no precious cultural relics in the Project area according to this evaluation. Besides, according to the opinions and recommendations of the local cultural relic protection department, during determination of the specific location of the construction in the next stage, thorough investigation should be carried out together with the local cultural relic’s protection department for the cultural relics of the proposed project area to ensure no impact of the Project.

9.1.2.3 Considerations of traffic barrier reduction

To solve the "split" problem caused by the Project, the design institute should carry out full consultation and screening with the government and mass of the Project area, to determine a reasonable form of construction and channel location on the basis of reasonable points and route selection, combining with route selection requirements. The design should take full account of the production, life and communication needs of local government and local residents, and set necessary interoperability structure, channels, bridges, etc.

According to the project design, the proposed project area should be provided with channels. Considering the local adjustment of the construction scheme of the next stage, on the premise of meeting the demand, the impact of the project construction on the obstruction of local residents should be minimized, necessary road-traffic channel should be provided for busy road sections of residents, so as to meet the demand of the production and living of local residents. Therefore, it has no obvious traffic inconvenience impact on the local residents.

9.1.2 Water conservation design

The water and soil loss caused by the construction of the Project must be protected according to *Law of the People's Republic of China on Water and Soil Conservation Implementation Regulations of Law of the People's Republic of China on Water and Soil Conservation, Management Method of Water and Soil Conservation Scheme for Development Construction Project* issued by the Ministry of Water Resources, the State Development Planning Commission, the State Environmental Protection Administration, *Technical Specifications on Water and Soil Conservation* (SD238-87) issued by the Ministry of Water Resources. Control principles and objectives of water and soil loss should be consistent with the national general requirements of soil and water conservation and environmental protection. The soil and water conservation facilities should be synchronized with the design, construction and inspection of the Project. Project Owner should bear control cost of water and soil loss caused by the construction of the Project.

The design institute and Construction Company of the Project should earnestly implement relevant measures of soil and water conservation design and the approval requirements of water
conservation department to fulfill soil and water conservation work of the Project.

**9.2 Measures to prevent pollution and mitigate impact during construction period**

The construction activities would impose different impacts on the environment of the Project area. The Project Owner has the responsibility to protect the environment and mitigate the environmental impacts during the construction stage of the Project. The Project Owner should include the environmental impact mitigation measures to the tender documents during preparation, and incorporate them in the contract and be implemented during the construction process, so as to supervise the construction workers to take effective environmental protection measures on the construction site and adjacent areas during construction to protect the environment and ensure the safety of local residents and construction workers. The Contractor should also include the implementation plan of environmental protection measures in the tender documents.

**9.2.1 Measures to reduce social environmental impacts**

1. Measures to reduce the social interference impact

   ● Set up publicity columns in the vicinity of the construction area for publicity, set up billboards, so that residents near the Project can further learn about the importance of the project construction; publicize the land acquisition, resettlement policies, etc. to the affected people to get more support from them for the Project, and better understand and appreciate the temporary disturbance of the Project.

   Set up billboard at the inlet of the construction site, indicating the Contractor, construction supervision unit and the hotline telephone numbers and contact names of local environmental protection bureau, so that the mass can contact relevant departments to solve the problem of construction noise, air pollution, traffic and other adverse impacts.

   ● Strengthen cooperation with local traffic management departments, properly plan the construction material transport, coordinate with local governments to avoid traffic congestion of existing roads. Jointly develop reasonable transportation schemes and transportation routes to minimize passing by nearby villages to reduce interference and pollution impacts of construction vehicles on the villagers. Ensure that the project construction does not damage public service facilities in the project area; the Contractor should provide temporary power supply, telecommunication, water supply and other devices; negotiation should be fulfilled before the connection of municipal pipeline.

2. Cultural relics protection
The construction should be suspended immediately in case that cultural relics are found, and the construction site and cultural relics should be protected, to prevent robbery, concealment, unauthorized privatization of cultural relics, and should be promptly reported to the local cultural relics protection departments, and the construction should be resumed after treatment of cultural departments.

(3) Protection and restoration of construction temporary land

Temporary land occupation scope during construction should be strictly controlled and is forbidden to be expanded without permission. The Project should minimize the occupation of vegetation of the area, especially the landscape works are. The effective protection of the existing vegetation area can provide a better construction basis for the implementation of landscape works. Thus, ecological protection measures defined in this report should be adopted to protect ground vegetation.

The construction site and temporary stacking yard should be leveled in a timely manner after the construction is completed. The construction site and temporary stacking yard should be arranged in the landscape construction area, so the temporary construction should minimize vegetation occupancy or better fulfill slash recovery to meet the needs of the later landscape works construction.

9.2.2 Measures to reduce the air pollution on the environmental

9.2.2.1 Road works and bridge works

The dust produced by earth and stone excavation and transport vehicles coming in and out of the site during construction of the road works and bridge works of the Project will have some impact on the ambient air quality in the Project area. Therefore, the corresponding measures proposed in EIA according to the characteristics of works are as follows:

(1) The site should be cleaned and watered according to weather and construction conditions to reduce secondary road dust regularly during construction. Each construction section shall be equipped with at least one sprinkler (purchased or rented);

(2) Transport vehicles of construction bulk materials should adopt a combination of tarpaulin covering and wet method, to reduce dust pollution to the atmosphere. Materials should be covered with tarpaulins during stacking; the construction site should be provided with fences or barriers to reduce the spread range of construction dust.

(3) Sealed dust mixing equipment equipped with smoke and dust removal device should be adopted to meet the environmental protection requirements of discharge up to standards and clean production. Site cleaning of dust construction site should be carried out after the completion of construction.
(4) The covering of topsoil at temporary stacking yard should be strengthened to avoid dust pollution caused by strong winds.

9.2.2.2 River channel works and water supply works

According to the construction characteristics of the river channel works and water supply works, specific mitigation measures for air pollution impact are as follows:

(1) Construction material stacking yard and topsoil temporary stacking yard provided for the Project should be far away from residential or other densely populated areas, at an open area at a distance of more than 200m downwind of residential areas, to reduce influences of material dust and harmful gas pollution on residents.

(2) Transport vehicle coming in and out of the construction site should slow down and travel at low speed, and the construction site should be regularly watered to reduce dust.

(3) The Construction Company is suggested to suspend earth excavation, and take stacking material covering and wetting, etc. measures to reduce dust pollution in case of over Class IV wind speed;

(4) Temporary stacking time of silt generated by river dredging should be minimized and be promptly used as landscape greening topsoil, so as to minimize stench pollution generated by silt piled up for a long time;

(5) The construction workers should be provided with anti-dust masks to reduce the dust's damage on the construction workers' health.

(6) Dust control measures during construction must meet the requirements of urban environmental management, and the environmental protection measures during the construction period shall be implemented according to the requirements.

**9.2.3 Prevention and control of water pollution**

**9.2.3.1 Surface water pollution prevention**

Water pollution control measures should be fulfilled during construction of the Project, including the construction site settings, domestic sewage and construction waste water treatment, etc., so as to avoid pollution of surface water quality.

1. **Road works and bridge works**

   (1) Management measures

   Construction management and project supervision should be strengthened; construction machinery should be strictly inspected to prevent water pollution due to oil leakage. Construction materials such as asphalt, oil and chemicals should be provided with temporary canvas for covering; necessary measures should be taken to prevent soil and dispersed construction materials from blocking existing river channel.
(2) Domestic sewage treatment measures during construction

The main impact of construction site of road works on the water environment is the domestic sewage discharge, and the impact on the water bodies relates with the number of construction workers. Construction camp is not provided for the Project, and construction domestic sewage is treated relying on the surrounding rented houses.

(3) Treatment of concrete mixing waste water

Concrete mixing during the construction period will produce a small amount of waste water containing SS, which will affect the receiving water body quality if being directly discharged. According to evaluation requirements, the construction site should be provided with temporary sedimentation tank for treatment of the waste water, and the latter should be reused without being discharged to the outside area.

2. River channel works and water supply (water treatment plant) works

(1) Management measures

The Project includes river dredging, river landscape and commercial buildings along the river, so it is required to pay special attention to the construction management of the areas near the river during construction, to avoid pollution of the nearby water body. Specific management measures include carrying out water environmental education for the construction site, so that the construction workers can understand the importance of water environmental protection; and strengthening of the construction supervision, and regular inspection and test of construction equipment. Besides, the corresponding water conservation measures of temporary works should be practically implemented.

(2) Domestic sewage treatment measures during the construction period

Various works of the Project are constructed at the same time, and the domestic sewage of construction workers should be treated by the existing sanitation facilities.

(3) Treatment of construction waste water

The main pollutant in waste water during the construction period is SS, which will affect the receiving water bodies if being directly discharged. According to the evaluation requirement, it should be reused after being treated by sedimentation tank instead of being discharged to the outside area.

(4) Environmental protection measures for river dredging works

The river improvement works of the Project adopts cofferdam construction technology, in addition to the disturbance to the riverbed during cofferdam construction, the construction processes are carried out within the cofferdam, basically ensuring separation of the construction process from water bodies. Coupled with functions of flood discharge and irrigation of the river,
the project construction will have little temporary effect on river water quality, which will disappear with the completion of the construction of water improvement works, and will not change the river water functions.

9.2.3.2 Underground water pollution control

The Project involves a large number of earth and stone excavation, which may touch to the underground aquifers. Therefore, according to the evaluation requirements, construction equipment and oil leakage should be prevented from direct pollution of groundwater or groundwater pollution after infiltration during earth and stone excavation of the Project.

In addition, temporary stacking yard for silt produced by river dredging of the Project should be provided with ditches for collection and treatment of the leachate generated by the silt before stacking. As the silt stacking yard is located in low-lying area, the impermeable membrane should be provided for anti-seepage treatment, to avoid pollution of groundwater due to silt leachate infiltration.

9.2.4 Acoustic environmental pollution prevention

Implementation of the Project mainly includes high-noise construction, construction equipment noise and aerodynamic noise, which will have some impact on the surrounding environment. Therefore, according to the evaluation requirements, specific acoustic environment control measures during the project construction period are as follows:

(1) Low-noise machinery should be adopted as much as possible. The construction equipment used during construction should undergo noise measurement under normal working condition in advance, and those exceeding the national standards should be prohibited from entering the site for construction. Regularly maintenance on the equipment should be provided during construction process to avoid noise increase due to poor equipment performance.

(2) According to the engineering characteristics of the Project, compared to the operation stage, the noise impact of construction period is short-term, mainly including disturbance for residents during nighttime construction. Therefore, construction work of noisy machinery should be prohibited at night (22:00~6:00); the construction time should be adjusted appropriately to avoid sensitive periods. The Contractor is required to reduce the construction noise by means of housekeeping, enhancing effective management of the percussion or shouting of personnel. The construction work should be arranged at weekends or holidays as much as possible; or temporary noise reduction measures, such as wooden acoustic panels should be provided. As for continuous construction work, the Construction Company should timely contact the environmental protection departments as the case may be, apply for night construction permits according to the provisions, and publicize announcement to gain public support as much as possible.
(3) Existing roads in the Project area will be used to transport construction materials during the construction period. The transport time of construction materials should be reasonably arranged. Vehicles should slow down and be prohibited from whistling at the above road sections in the vicinity of settlements.

(4) The use, disassembly and handling of steel formwork should be gent as much as possible, to avoid noise due to collision of formworks.

(5) The Project Owner shall instruct the Construction Company to post announcements and complaint telephone in the construction site. The Project Owner should get in touch with the local environmental protection departments upon receipt of a report, so as to promptly deal with various environmental disputes.

9.2.5 Solid waste pollution prevention

According to relevant regulations of *Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste*, small rubbish dump sites is suggested to be provided low-lying area around the construction site during the construction period; domestic rubbish at the construction site should be classified and cleaned, and handed over to the nearby urban sanitation department to regularly sent to the urban landfill for treatment. Maintenance management of rubbish stacking yard should be strengthened to avoid scattering of rubbish due to random stacking. Temporary stacking of construction rubbish shall not be located near the river embankment, and be periodically sprayed with bactericide and pesticide to reduce breeding of mosquito and germs.

In addition, river dredging of the Project will produce a certain amount of 106,800 m³ silt. Silt generated by dredging of the Project should be placed in temporary storage yard for air dry after being packed in jute bags. According to the silt monitoring results, various indicators of bottom sediment soil are in line with Class II standards of *Soil Environmental Quality Standards* (GB15618-1995), without heavy metals exceeding the standards. Therefore, part of the dried silt is used for wetland landscape planting soil backfill and landscape modeling of the Project area, and the remaining dried silt are packed in woven bags and be transported by sealed vehicles to be used as landscape greening planting soil of Hongya County municipal road construction.

9.2.6 Temporary works prevention measures

The Project is provided with construction site and temporary silt stacking yard. After investigation, there is no settlements, schools, etc. within 200m range of the construction site and temporary silt stacking yard of the Project. Sprinkling is adopted to reduce dust; transport vehicles adopt a combination of tarpaulin covering and wet method to avoid affecting the surrounding environment. Temporary silt stacking yard is provided with ditches before stacking, and be
provided with impermeable membrane for anti-seepage treatment, and the leachate will be discharge into the moat after treatment in sedimentation tank. After the construction is completed, the construction site and temporary silt stacking yard should be timely leveled. The solidified layer formed on the surface should be removed and treated in a concentrated manner, and then be sent to the spoil site nearby. Temporary construction site should be restored to meet the requirements of later green space.

9.3 Measures to prevent pollution and mitigate impact during operation period

9.3.1 Air pollution control measures

9.3.1.1 Road works and bridge works

Atmospheric pollution of the proposed road works of the Project during the operation period mainly comes from vehicle exhaust, and the specific control measures taken are as follows:

(1) Vehicle emission inspection system is implemented for spot check of vehicle emissions, to prevent the vehicles with excessive emissions from travelling on the road;

(2) Environmental management should be strengthened. Road management authority should set up environmental management agency, and entrust the environmental protection departments to carry out environmental air monitoring on a regular basic at the monitoring points specified in the evaluation.

9.3.1.2 New ecological parking lot

The main gas sources of new ecological parking lot of Liujiang Town Subproject during the operation period are automobile exhaust, mainly containing CO, NO2 and HC. Exhaust emissions amount is related to vehicle access frequency. The ecological parking lot is located in open terrain, which is easy for spread of vehicle exhaust. Coupled with large greening area of the ecological parking lot, the vehicle exhaust has relatively small impact on the environment.

9.3.2 Acoustic environmental pollution control measures

9.3.2.1 Road works

(I) Rational planning of urban layout. In principle, sensitive buildings such as schools, hospitals and concentrate residential areas, etc. should not be built or expanded within the noise prevention distance. In addition to the recommendation of rational planning of land functions on both sides of the road, the building layout and acoustic design should also be strengthened to ensure that the indoor environment of sensitive buildings can meet the functional requirements. According to the overall planning of Liujiang Town, the surrounding planning of roadway of Liujiang Town Subproject includes mainly commercial buildings and a small amount of residential areas. Therefore, according to the evaluation requirements, commercial buildings such as shopping
malls, restaurants, etc. can be built close to both sides of the road to minimize the impact of traffic noise on residents. Besides, the layout of the environmentally sensitive buildings should be optimized to arrange the noise-sensitive functional areas on the far side of the road.

(II) All of the predicted day and night noise values of 3 sensitive points of Liujiang Town Subproject during the early operation period (2016), medium-term operation period (2023) and long-term operation period (2030) meet the Class 2 limit value requirements of Acoustic Environmental Quality Standards, without exceeding the standards. Therefore, the relevant management requirements put forward in the EIA are as follows: after the road is completed and put into use, traffic control should be strengthened to avoid excessive noise due to traffic congestion; vehicle noise monitoring should be enhanced; the vehicles with excessive noise should be prevented from driving; overspeed is prohibited.

9.3.2.2 Water supply (water treatment plant) works

Noise sources of water treatment plant works of Liujiang Town Subproject mainly include pump noise in water pumping house and equipment noise generated by fans. There is little acoustic environmental impact of equipment noise of water treatment plant during the operation period of the Project after taking the measures such as rational equipment distribution, plant sound insulation, and base shock absorption.

9.3.2.3 New ecological parking lot works

The noise of the ecological parking lot during the operation period is noise of vehicles coming in and out of the site, which is low noise. Management of the parking lot should be strengthened and honking is forbidden. Management measures such as speed limit and no-honking of vehicles coming in and out of the parking lot should be adopted, and such noise will not cause significant impact on the acoustic environment of project area.

9.3.3 Water environment protection measures

Waste water during the operation period of the Project mainly comes from the surface runoff after the completion of road works and bridge works. For this kind of pollution, road management during the operation period should be strengthened to keeping the road clean. Pollutants on the road leaked by transport vehicles should be timely removed. Measures such as reducing the scour pollutants of surface runoff should be taken.

Production waste water of the new waste water treatment plant of the Project during operation period mainly comes from silt disposal water of sedimentation tank and backwash water of filter. The backwash water is mainly recycled in the recycling tank without being discharged to the outside area; the supernatant liquid of silt disposal water is discharged into the nearby ditches in line with the standards after treatment. After the project is put into operation, the manpower quota
is 11 personnel. As there is no canteen in the plant area, there is only a small amount of domestic sewage from the office area. The daily domestic and office sewage generated is 1.1 m$^3$/d, and is transported by tankers to the local waste water treatment plant before discharge.

Therefore, the above measures are reasonable and feasible as they can realize effective treatment of the waste water generated during the operation period of the Project.

### 9.3.4 Solid waste environmental protection measures

Solid waste of the proposed road works and bridge works of the Project during the operation period mainly includes the rubbish generated by vehicles coming in and out the site, and solid waste scattered by vehicles. If not properly disposed, they will affect the landscape, cause air pollution, the spread of disease and endanger human health. Solid waste should be collected in a concentrated manner and be transported to nearby rubbish collection point for disposal and free throwing is forbidden, so as to prevent the impact on the environment during the operation period.

Solid waste of the production plant area of the water treatment plant includes dried sludge and office and domestic waste. The dried sludge is transported to the landfill for disposal; office and domestic waste is collected in a concentrated manner and then will be submitted to the local sanitation department for unified disposal.

### 9.4 Investment estimation of environmental protection works

#### 9.4.1 One-time investment of environmental protection works

Various environmental protection measures for the proposed project include environmental protection facilities, equipment, etc., which will be included in the budget of the proposed project. The investment estimation of environmental protection measures for the Project is shown in Table 9-1. According to statistics, the environmental protection investment of the Project reaches about RMB 3,550,900, accounting for 3.01% of the total project investment (including additional investment of RMB 1,544,500 for soil and water conservation).

<table>
<thead>
<tr>
<th>Time</th>
<th>Item</th>
<th>Control Measures</th>
<th>QTY</th>
<th>Amount (RMB in 10,000s)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction period</td>
<td>Domestic sewage treatment</td>
<td>Construction site temporary tank</td>
<td>6</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Oil removal) Separation tank</td>
<td>6</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silt leachate sedimentation tank</td>
<td>1</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Atmospheric prevention and control measures</td>
<td>Tarpaulin, construction fence</td>
<td>/</td>
<td>15.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Renting of sprinkler sprinkling for dust prevention</td>
<td>2</td>
<td>4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Silt stench prevention (plant)</td>
<td>1</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Environmental Protection Measures and Techno-Economic Feasibility

#### 9.0 Environmental Protection Measures

<table>
<thead>
<tr>
<th><strong>Time</strong></th>
<th><strong>Item</strong></th>
<th><strong>Control Measures</strong></th>
<th><strong>QTY</strong></th>
<th><strong>Amount (RMB in 10,000s)</strong></th>
<th><strong>Remarks</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>liquid, disinfectant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevention and control of noise</td>
<td>Low noise equipment, strengthening of equipment maintenance</td>
<td>/</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction fence (3 temporary sound barriers,)</td>
<td>/</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solid waste treatment</td>
<td>Domestic rubbish collection and disposal</td>
<td>/</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Silt bagging temporary storage and utilization</td>
<td></td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional soil and water conservation measures</td>
<td>Engineering measures, measures of the vegetation, temporary measures, etc.</td>
<td>/</td>
<td>154.45</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental monitoring</td>
<td>Environmental monitoring during the construction period</td>
<td>/</td>
<td>115.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevention and control of groundwater</td>
<td>Impervious membrane for silt stacking yard</td>
<td></td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste gas treatment</td>
<td>Provision of non-honking signs and speed reducer</td>
<td>/</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reserved noise cost</td>
<td>/</td>
<td>8.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste water treatment</td>
<td>Shock absorption, sound insulation of equipment</td>
<td>1</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tanker transport of domestic sewage</td>
<td>/</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solid waste treatment</td>
<td>Trash can</td>
<td>4</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rubbish collection facilities</td>
<td>4</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental protection acceptance</td>
<td>Completion acceptance of environmental protection works</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ecological measures</td>
<td>Greening</td>
<td>/</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental monitoring</td>
<td>Environmental monitoring during the operation period</td>
<td>/</td>
<td>22.74</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total investment</strong></td>
<td></td>
<td></td>
<td>355.09</td>
<td></td>
</tr>
</tbody>
</table>
9.4.2 Proportion of environmental investment against the total project construction investment

The estimated total project construction investment is RMB 118.0732 million, of which the one-time environmental protection investment reaches RMB 3.5509 million, accounting for 3.01% of the total project investment.
10.0 Environmental Protection Management and Environmental Monitoring

10.1 Environmental protection management

10.1.1 Environmental protection management agency

The environmental protection work during construction of the Project shall be executed by the construction headquarters of the project owner and the work during operation shall be organized by Hongya County Housing and Urban-Rural Construction Bureau.

<table>
<thead>
<tr>
<th>Project stage</th>
<th>Environmental protection content</th>
<th>Environmental protection measures execution organization</th>
<th>Environmental protection management department</th>
<th>Environmental protection supervision department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design period</td>
<td>Prepare the environmental impact assessment and environmental engineering design.</td>
<td>EIA organization and designer</td>
<td>Hongya County Housing and Urban-Rural Construction Bureau</td>
<td>Hongya County Environmental Protection Bureau</td>
</tr>
<tr>
<td>Construction period</td>
<td>Implement environmental protection measures, solve sudden environmental problems and perform environmental protection supervision during construction.</td>
<td>Project construction contractor</td>
<td>Construction headquarters</td>
<td>Sichuan Environmental Protection Department Hongya County Environmental Protection Bureau</td>
</tr>
<tr>
<td>Operation period</td>
<td>Environmental monitoring and management</td>
<td>Monitoring organization</td>
<td>Hongya County Housing and Urban-Rural Construction Bureau</td>
<td>Sichuan Environmental Protection Department Hongya County Environmental Protection Bureau</td>
</tr>
</tbody>
</table>

10.1.2 Main functions of environmental protection management system

Implement and execute various environmental protection policies and regulations of the state, Sichuan Province and Hongya County; supervise the preparation of the environmental implementation plan and supervise the implementation of various environmental protection measures proposed in the EIA. Organize preparation of the pollution accident disposal plan and investigate and treat the accidents; organize implementation of the environmental monitoring plan; take charge of environmental protection research, training, data collection and advanced
technology popularization of the department and improve the staff’s environmental protection consciousness and quality; and take charge of operation and maintenance of the environmental protection equipment.

10.1.3 Environmental protection management plan and environmental protection supervision plan

The environmental protection management plan during implementation of the Project is shown in Table 10-2, the construction points with significant environmental impact during construction shall be subject to key management, the countermeasures are shown in Table 10-3 and the environmental protection supervision plan is shown in Table 10-4.

<table>
<thead>
<tr>
<th>Item</th>
<th>Environmental impact</th>
<th>Location</th>
<th>Mitigation measures</th>
<th>Responsible organization</th>
<th>Supervision measures</th>
<th>Period</th>
<th>Supervision agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction period</td>
<td>Engineering and domestic wastewater; water and soil losses caused by excavation, filling and spoil; pollution such as construction dust and noises; impact on existing road traffic.</td>
<td>Construction site; temporary soil storage yard; existing road.</td>
<td>The construction and production wastewater of the Project shall be treated by the sedimentation tank and then recycled, the domestic sewage can be treated by the existing environmental sanitation facilities; during construction, attention shall be paid to watering to prevent dust and construction shall be performed within the construction contract.</td>
<td>Construction contractor</td>
<td>Sign the environmental protection responsibility contract with the construction contractor and assign a special person from the headquarters for supervision.</td>
<td>Whole construction period</td>
<td>Construction headquarters and local environmental protection department</td>
</tr>
</tbody>
</table>
time limit to reduce the impact of construction noises on the residents; the construction silt shall be disposed reasonably according to the monitoring data; the vehicle access shall be arranged to the maximum extent, so as to block the existing road traffic.

Operation period  
Noise pollution and atmospheric pollution after operation of roads and bridges and wastewater and solid wastes produced by the water supply plant; Both sides of proposed roads and bridges and the water treatment plant of water supply works  
Arrange road speed limit signs and reserve noise monitoring costs for sensitive points; recycle the discharged muddy wastewater and collect, export, fill and dispose the dried sludge in a concentrated manner.  
Project owner  
Implement the supervision measures of the environmental protection bureau and the water conservation department.  
Whole operation period  
Sichuan Environmental Protection Department and Hongya County Environmental Protection Bureau

Table 10-3 Impact of main construction points and mitigation measures

<table>
<thead>
<tr>
<th>Main construction point</th>
<th>Predicted impact</th>
<th>Measures to be taken</th>
<th>Existing impact</th>
<th>Implementation organization</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction site</td>
<td>Ground vegetation damages, water and soil losses, dust and noises</td>
<td>Restore vegetations, perform construction within the time limit and water the pavement.</td>
<td>Increase the dust in the construction area.</td>
<td>Contractor</td>
<td>Construction headquarters</td>
</tr>
<tr>
<td>Construction machinery</td>
<td>Oily sewage may influence the surface water.</td>
<td>Utilize the existing treatment system at the machine maintenance point for treatment.</td>
<td>Increase the oil content of the surface water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage facility</td>
<td>Water and soil loss</td>
<td>Reinforce various channels, reduce erosion of surface runoff and guarantee smooth drainage.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary land</td>
<td>Damages of ground vegetations and environmental impact of domestic sewage and wastes</td>
<td>Restore vegetations and assign a special person to take charge of cleanliness and health of the construction site.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earthworks</td>
<td>Water and soil losses and damages of vegetations</td>
<td>Store soils at the temporary soil storage yard and restore the cut-over land.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation of materials</td>
<td>Dust and noises</td>
<td>Water the pavement and perform construction within the time limit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material yard</td>
<td>Dust during stacking</td>
<td>Stack the materials in a concentrated manner and arrange enclosure works to prevent dust.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 10-4 Environmental protection supervision plan**

<table>
<thead>
<tr>
<th>Project stage</th>
<th>Supervision agency</th>
<th>Supervision content</th>
<th>Supervision objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction period</td>
<td>Hongya County Environmental Protection Bureau</td>
<td>Audit the statement.</td>
<td>Guarantee complete EIA content, reasonable arrangement of special subjects and focused key points; guarantee reflection of significant environmental impact possibly generated by the Project; and guarantee specific and feasible implementation plan for environmental protection measures.</td>
</tr>
<tr>
<td>Sichuan Environmental Protection Department</td>
<td>Audit preliminary design of environmental protection.</td>
<td>Check whether the environmental protection investment is implemented.</td>
<td>Guarantee “Three-simultaneous”. Guarantee implementation of the environmental protection investment.</td>
</tr>
</tbody>
</table>
### 10.0 Environmental Protection Management and Environmental Monitoring

<table>
<thead>
<tr>
<th>Department</th>
<th>Responsibilities</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban planning and environmental protection department and land management department</td>
<td>Check coordination of the project construction and urban planning; check suitability of the land and the construction site; and check the treatment facilities for construction dust, noises, production and domestic sewage for rationality.</td>
<td>Minimize the environmental impact.</td>
</tr>
<tr>
<td>Sichuan Environmental Protection Department</td>
<td>Check whether the environmental protection measures are implemented.</td>
<td>Guarantee “Three-simultaneous”.</td>
</tr>
<tr>
<td>Local environmental protection and firefighting department</td>
<td>Strengthen the supervision to prevent sudden accidents, eliminate potential accident hazards, prepare an emergency plan for accidents and check the accident emergency response capability of the road.</td>
<td>Eliminate potential accident hazards to prevent malignant environmental events or serious casualties.</td>
</tr>
</tbody>
</table>

**10.1.4 Precautions in environmental protection management**

Bidding stage: The Contractor shall provide the environmental protection content in tendering and the winning contract shall contain the clauses related to implementation of environmental protection measures.

After commencement of construction, the project owner shall assign 1-2 full-time or part-time environmental protection person(s) responsible for environmental protection management and supervision during construction. The key points include prevention of water and soil losses, treatment and emission of construction and domestic sewage, construction noises and dust.

Environmental protection management during operation shall be implemented by Hongya County Housing and Urban-Rural Construction Bureau.

**10.2 Environmental monitoring plan**

**10.2.1 Preparation purpose and principle**

The purpose to prepare the environmental monitoring plan is to supervise implementation of various environmental protection measures, adjust the environmental protection action plan according to the monitoring structure at proper time and provide the basis for implementation of
environmental measures. The preparation principle is determined according to the main environmental impact at each period predicted, sections possibly exceeding standards and indexes exceeding standards, and the key points are various sensitive areas.

10.2.2 Monitoring agency and monitoring item

The Project includes many subdivisional works. Therefore, a monitoring plan will be prepared for the construction period and the operation period of various works in the assessment.

10.2.2.1 Monitoring plan during construction

1. Hongchuan Town sub-project

The following environmental monitoring plan of the Project is prepared according to the characteristics of the proposed project and the environmental characteristics of the project area:

<table>
<thead>
<tr>
<th>Project name</th>
<th>Environmental factor</th>
<th>Monitoring location</th>
<th>Monitoring item</th>
<th>Monitoring frequency and period sampling time</th>
<th>Implementation agency</th>
<th>Management agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>River channel works</td>
<td>Atmospheric environment</td>
<td>Construction site and three sensitive points along the line</td>
<td>PM$_{10}$</td>
<td>Twice with a monitoring period of 3d for each time and sampling during construction.</td>
<td>Entrusted environmental protection station</td>
<td>Hongya County Environmental Protection Bureau</td>
</tr>
<tr>
<td></td>
<td>Acoustic environment</td>
<td>Three sensitive points along the line</td>
<td>L$_{Aeq}$</td>
<td>Once per month with a monitoring period of 1d for each time, and once in the daytime and in the nighttime respectively.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surface water environment</td>
<td>Sections of the starting point and the destination of river channel works</td>
<td>pH, COD, ammonia nitrogen, BOD$_5$ and suspended solids</td>
<td>Twice with a monitoring period of 2d for each time and sampling during construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sludge</td>
<td>Destination of river channel works</td>
<td>Copper, zinc, nickel, lead and cadmium</td>
<td>Once, sampling for once at the end of the construction period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline works</td>
<td>Atmospheric environment</td>
<td>Construction site</td>
<td>PM$_{10}$</td>
<td>Twice with a monitoring period of 3d for each time and sampling during construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acoustic environment</td>
<td>Construction site</td>
<td>L$_{Aeq}$</td>
<td>Once per month with a monitoring period of 1d for each time, and</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Residents around the construction site: pH, COD, ammonia nitrogen, BOD₅, and chloride are monitored twice with a monitoring period of 2d for each time and sampling during construction.

<table>
<thead>
<tr>
<th>Project name</th>
<th>Environmental factor</th>
<th>Monitoring location</th>
<th>Monitoring item</th>
<th>Monitoring frequency and period and sampling time</th>
<th>Implementation agency</th>
<th>Management agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road and bridge works</td>
<td>Atmospheric environment</td>
<td>Construction site and four sensitive points along the line</td>
<td>PM₁₀</td>
<td>Twice with a monitoring period of 3d for each time and sampling during construction.</td>
<td>Entrusted environmental protection monitoring station</td>
<td>Hongya County Environmental Protection Bureau</td>
</tr>
<tr>
<td></td>
<td>Acoustic environment</td>
<td>Four sensitive points along the line</td>
<td>Lₐₑₐ</td>
<td>Once per month with a monitoring period of 1d for each time, and once in the daytime and in the nighttime respectively.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surface water environment</td>
<td>200m downstream from the places crossing Huaxihe and Yangliuhe Bridges</td>
<td>pH, COD, ammonia nitrogen, BOD₅, and suspended solids</td>
<td>Twice with a monitoring period of 2d for each time and sampling during construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water supply works</td>
<td>Atmospheric environment</td>
<td>Water treatment plant construction place</td>
<td>PM₁₀</td>
<td>Once with a monitoring period of 3d and sampling during construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acoustic environment</td>
<td>Water treatment plant construction place</td>
<td>Lₐₑₐ</td>
<td>Once per month with a monitoring period of 1d for each time, and once in the daytime and in the nighttime respectively.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hongya County Restructuring Component of Sichuan Small Towns Development Project by World Bank Loans

10.0 Environmental Protection Management and Environmental Monitoring

10.2.2.2 Monitoring plan during operation

The impact of Hongchuan Town sub-project occurs during construction and no impact occurs during operation, so the monitoring plan may not be assigned. The environmental monitoring plan during operation of Liujiang Town sub-project of the Project is as follows:

<table>
<thead>
<tr>
<th>Project name</th>
<th>Environmental factor</th>
<th>Monitoring location</th>
<th>Monitoring item</th>
<th>Monitoring frequency and period and sampling time</th>
<th>Implementation agency</th>
<th>Management agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road and bridge works</td>
<td>Atmosphere</td>
<td>Four sensitive points along the line</td>
<td>NO₂, PM_{10} and CO</td>
<td>Once per year with a monitoring period of 3d for each time</td>
<td>Entrusted environmental protection monitoring station</td>
<td>Hongya County Environmental Protection Bureau</td>
</tr>
<tr>
<td></td>
<td>Acoustic environment</td>
<td>Two sensitive points along the line</td>
<td>L_{Aeq}</td>
<td>Twice per year with a monitoring period of 1d for each time, and once in the daytime and in the nighttime respectively.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecological parking lot works</td>
<td>Atmospheric environment</td>
<td>Construction site</td>
<td>PM_{10}</td>
<td>Once with a monitoring period of 3d and sampling during construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Acoustic environment</td>
<td>Residents of Shuanghe Village around the construction site</td>
<td>L_{Aeq}</td>
<td>Once per month with a monitoring period of 1d for each time, and once in the daytime and in the nighttime respectively.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10.2.3 Environmental monitoring reporting system

After completion of monitoring for each time, the monitoring organization must submit and report the monitoring report level by level.

10.2.4 Environmental monitoring cost

Since environmental monitoring is entrusted to a qualified monitoring organization, the cost mainly includes the transportation expenses, sampling costs, analysis costs and salaries of the monitoring personnel. The environmental monitoring cost during construction of the Project is RMB 1.159 million and the annual monitoring cost during operation is RMB 0.2274 million. See Table 10-8 and Table 10-9 for the specific content.

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Monitoring content</th>
<th>Project</th>
<th>Monitoring times</th>
<th>Unit cost (RMB in 10,000s)</th>
<th>Total cost (RMB in 10,000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction period</td>
<td>Hongchuan Town sub-project</td>
<td>Atmosphere</td>
<td>River channel works</td>
<td>4×2×3=24</td>
<td>1.5</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise</td>
<td>River channel works</td>
<td>3×1×12=36</td>
<td>0.03</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sewage pipe works</td>
<td>1×1×12=12</td>
<td>0.03</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Surface water</td>
<td>River channel works</td>
<td>2×2×2=8</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ground water</td>
<td>Sewage pipe works</td>
<td>1×2×2=4</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>River channel works</td>
<td>1</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Table 10-8 Estimation of environmental monitoring cost during construction
### Table 10-8 Estimation of environmental monitoring cost during construction (continued)

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Monitoring content</th>
<th>Project</th>
<th>Monitoring times</th>
<th>Unit cost (RMB in 10,000s)</th>
<th>Total cost (RMB in 10,000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liujiang Town sub-project</td>
<td>Atmosphere</td>
<td>Road and bridge works</td>
<td>5×2×3=30</td>
<td>1.5</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water supply works</td>
<td>1×1×3=3</td>
<td>1.5</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Urban rainwater garden works</td>
<td>1×1×3=3</td>
<td>1.5</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ecological parking lot works</td>
<td>1×1×3=3</td>
<td>1.5</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Noise</td>
<td>Road and bridge works</td>
<td>4×1×12=36</td>
<td>0.03</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water supply works</td>
<td>1×1×12=12</td>
<td>0.03</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Urban rainwater garden works</td>
<td>1×1×12=12</td>
<td>0.03</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ecological parking lot works</td>
<td>1×1×12=12</td>
<td>0.03</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface water</td>
<td>Road and bridge works</td>
<td>2×2×2=8</td>
<td>0.3</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water supply works</td>
<td>1×1×2=2</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>115.9</td>
</tr>
</tbody>
</table>

### Table 10-9 Estimation of environmental monitoring cost during operation (Liujiang Town)

<table>
<thead>
<tr>
<th>Time</th>
<th>Monitoring content</th>
<th>Project</th>
<th>Monitoring times</th>
<th>Unit cost (RMB in 10,000s)</th>
<th>Annual total cost (RMB in 10,000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation period</td>
<td>Air quality</td>
<td>Road and bridge works</td>
<td>4×1×1=12</td>
<td>1.5</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water supply works</td>
<td>1×1×3=3</td>
<td>1.5</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>Noise</td>
<td>Road and bridge works</td>
<td>2×2×1=4</td>
<td>0.03</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water supply works</td>
<td>1×2×1=2</td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ecological parking lot works</td>
<td>1×2×1=2</td>
<td>0.03</td>
<td>0.06</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22.74</td>
</tr>
</tbody>
</table>
10.3 Environmental supervision plan

10.3.1 Environmental supervision objective

Environmental supervision shall be based on the relevant laws, regulations, policies and technical standards prepared and issued by the state and relevant competent departments as well as the approved design documents and bids and the supervision and construction contracts signed according to the laws. According to the scope and content of environmental supervision services, the environmental supervision obligations shall be performed to serve the Project independently, fairly, scientifically and effectively and comprehensive environmental supervision shall be implemented to meet the environmental protection requirements for the Project in the aspects such as design, construction and operation.

10.3.2 Principles to be followed in environmental supervision

The environmental supervision activities for construction of the Project shall be performed according to the criteria of law-abiding, integrity, fairness and science. The principle that the environmental supervisor is a third party shall be established, the environmental management by the environmental supervisor and the project owner shall be strictly separated from the environmental supervision and law enforcement by the governmental department, and it shall serve for environmental management by the project owner and the governmental department.

Environmental supervision shall be included in the engineering supervision management system and the position of environmental supervision shall not be weakened. In the supervision work, the relationship with the project owner, the construction contractor, the project supervisor, the environmental supervisor, the environmental monitoring organization and the governmental environmental administrative department, etc. shall be strengthened and coordinated, so as to create favorable conditions for environmental supervision.

The supervisor shall prepare a standardized supervision system meeting the actual situations of the Project according to the project characteristics, so as to enable orderly performance of the supervision work.

10.3.3 Environmental supervision scope

Scope of environmental supervision: The project location and the project affected zones.

Scope of work: The construction site and the ancillary facilities, etc. and the areas with production and construction causing environmental pollution and ecological damages to the surroundings within above scope; and the areas taken with environmental protection measures against the environmental impact caused by operation of the Project.
Work stage: ① Environmental supervision at the construction preparation stage; ② environmental supervision at the construction stage; ③ environmental supervision at the project warranty stage (handover and defects liability period).

10.3.4 General procedures of environmental supervision

(1) Prepare the environmental supervision scheme during construction of the Project;

(2) Prepare the detailed environmental supervision rules according to the project construction progress and all environmental protection measures;

(3) Perform environmental supervision during construction according to the detailed environmental supervision rules;

(4) Participate in environmental protection acceptance of the Project and sign the environmental supervision opinions; and

(5) After completion of supervision items, submit the supervision files and data to the legal person of the Project.

10.3.5 Specific working method of environmental supervision

(1) Examine whether the environmental protection measures in the preliminary design and the construction drawing design of the Project correctly implement the environmental protection measures put forward in the approved environmental impact assessment;

(2) Coordinate with the project owner in organization of environmental protection training on the project construction, design and management personnel;

(3) Audit relevant environmental protection clauses of the bidding documents and the project contract;

(4) Supervise the measures to protect the ecological, water, atmospheric and acoustic environment and reduce the environmental impact of the Project during construction as well as the construction quality of the environmental protection works and perform intermediate acceptance and signing according to the standards;

(5) Systematically record the environmental impact caused by construction of the Project, the effects of the environmental protection measures and the construction quality of the environmental protection works;

(6) Timely reflect relevant environmental protection design and construction accidents to the environmental supervision leading group and put forward solutions; and
(7) Draft the environmental supervision work plan and summary of the Project.

10.3.6 Environmental supervision system

The environmental supervisor shall establish the working system including job logging, personnel training, reports, correspondences and regular meetings.

10.3.7 Environmental supervision agency

Engineering environmental supervision on implementation of the environmental protection measures in the design documents during construction shall be entrusted by the project owner to the organization with the engineering supervision qualification subjected to environmental protection training. In order to guarantee execution of the supervision plan, the project owner shall sign the environmental supervision contract during construction with the supervisor before construction.

10.3.8 Technical key points of environmental supervision

See Table 10-10 for the supervision plan during construction.

The environmental supervisor shall collect the relevant data of the proposed project, including the basic information of the Project, the EIA (including the water and soil conservation scheme), the environmental protection design, the equipment, production mode and management of the construction contractor, the environmental conditions of the construction site, the pollutant discharge rules during construction and the control measures, etc.

The environmental supervision plan during construction shall be prepared according to the Project and the construction method. The key items, inspection modes and methods for inspection at different times shall be determined according to the construction schedule and the pollutant discharge behavior. The technical key points of supervision are as follows: mainly checking the vegetation and landscape protection measures at the initial stage of construction; mainly checking emissions of construction noises and construction and domestic sewage, behaviors of borrow soils/spoil works and protection, etc. at the middle stage; and checking the road vegetation restoration conditions, etc. at the late stage.

(I) Checking the vegetation protection measures at the construction site

Relevant protective measures prepared by the construction contractor shall be audited and well checked at the site. Since the construction process changes the original harmonious landscape at the site, the methods such as restoration of vegetations and landscaping shall be adopted to reduce the impact.
### Table 10-10 Environmental supervision plan during construction

<table>
<thead>
<tr>
<th>Supervision item</th>
<th>Supervision position</th>
<th>Supervision time and frequency</th>
<th>Implementation agency</th>
<th>Supervision agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological environment</td>
<td>Temporary soil storage yard and construction site</td>
<td>Random inspection from time to time</td>
<td>Organization with engineering supervision qualification subjected to environmental protection training</td>
<td>Hongya County Environmental Protection Bureau</td>
</tr>
<tr>
<td>Water environment</td>
<td>Construction site</td>
<td>Random inspection from time to time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water and soil conservation</td>
<td>Temporary soil storage yard, etc.</td>
<td>Random inspection from time to time, particularly during May through October (rainy season)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape</td>
<td>Project implementation area</td>
<td>Random inspection from time to time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient air</td>
<td>Storage yard and batching station, etc.</td>
<td>Random inspection from time to time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(II) Checking temporary soil stockpiles and earth and rock excavation during construction

During construction, the temporary soil stockpiles shall be timely transported to the soil storage yard and the drainage and protection measures for the temporary storage yard shall be strengthened, otherwise dust may occur under dry climatic conditions and water and soil losses may occur in the rainy season. Meanwhile, the cleaning and transportation tools shall be supervised and it shall be checked whether the disposal method for dust in transit meets the requirements. The selected disposal place must be approved by the environmental protection department and relevant departments.

(III) Check water and soil conservation during construction

The water and soil conservation conditions shall be patrolled and checked. The applications for audit and quality certificates for the engineering materials, seeds and seedlings to be mobilized as reported by the construction contractor shall be audited and the mobilized materials shall be subject to random inspection by the parallel inspection or evidential sampling method according to relevant codes.

(IV) Checking sewage discharge

1. Checking water quality

Whether the wastewater discharged from the pollution source meets the standards is an
important inspection content. Visual inspection shall be performed on the discharged wastewater to observe the apparent characters for abnormalities. If any problem is found, it shall be timely notified to the construction contractor for rectification.

2. Checking water-using processes and equipment

Firstly, it shall be checked whether the prohibited processes and equipment polluting the water environment are used; secondly, the unreasonable factors in utilization of water resources shall be checked, and the pollutant discharge organizations shall be urged to improve the process equipment and production management, save water and reduce discharge of sewage; and thirdly, it shall be checked whether any water-polluting project violating the national technical policies is constructed.

3. It shall be checked whether any toxic substance is discharged into the water body.

Articles 27–40 in *Water Pollution Prevention and Control Law of the People's Republic of China* specify that it is strictly prohibited to discharge the pollutants of the specified categories into the water body, which shall be considered as an important content of inspection.

4. Treatment and inspection of wastewater

The treated water amount, water quality, operation management of treatment facilities and treatment effect, etc. shall be mainly checked.

(V) Inspection of construction noises

1. Checking the equipment producing noises

It shall be checked whether the equipment producing noises is the obsolete product of which the production, sales, import and usages are prohibited by the state. The general sound level of low-noise fans is about 70dB.

2. Checking management of the equipment producing noises

The construction contractor shall be supervised to strengthen maintenance of equipment, timely replace wear parts and reduce noises. Management of the equipment producing noises also includes reasonable scheduling for production. In order to reduce environmental impact, for the sections with residential areas nearby the route, high-noise construction machineries should not be operated in the noon and nighttime, etc. The noise monitoring records of the construction contractor shall be checked. If any problem is found, it shall be promptly notified to the construction contractor for rectification.
3. Checking traffic noises

Measures shall be taken if it is found that the functional standards are exceeded. The measures to be taken include strengthening traffic management, strengthening annual inspection of vehicles and taking anti-noise measures.

(VI) Control and inspection of atmospheric pollution

Construction dust mainly includes traffic dust, dust at the construction site and dust at the storage yard. The construction contractor shall arrange the dust prevention equipment such as packaging and stacking and timely watering and spraying, etc.

During construction of road works of the Project, it is generally required to melt asphalt in an enclosed container, take smoke abatement measures and use the specified methods and equipment.
11.0 Economic Cost-benefit Analysis on Environmental Impact

This Section describes the cost and expense estimate of major work, such as environmental protection design of the Project, environmental protection measures and environmental management during the construction period, environmental protection engineering and measures during the operation period, and management during operation period, and gives a brief cost-benefit analysis thereof.

11.1 Purpose of environmental economic cost-benefit analysis

The social production course, in terms of environment, is a course to exploit resources from the nature and discharge waste to the environment. The expansion of production capacity is more likely to increase the degree of exploiting and discharging, and cause greater environmental impact. Therefore, it needs to consider the environmental benefit and social benefit besides the economic benefit of a construction project. The purpose of environmental economic cost-benefit analysis is mainly to study the efficiency of environmental protection cost input for a construction project. Environmental economic assessment method is applied to analyze the environmental benefit resulted from environmental protection cost of the Project and the economic effect of investment.

11.2 Method of environmental economic cost-benefit analysis

Environmental economic cost-benefit analysis is an important part of environmental impact assessment of a construction project, an important basis for comprehensive assessment and determination of whether the investment in environmental protection of a construction project is able to compensate or how much can it compensate the possible environmental damage resulted therefrom. Different from engineering economic analysis, environmental economic cost-benefit analysis not only needs to calculate the investment and cost for pollution control and management, but also needs to calculate the possible environmental economic benefit, social environmental benefit and damage due to environmental pollution. The economic cost-benefit analysis on environmental impact of a construction project is an integrated reflection of social environmental benefit and environmental economic benefit of a project.

11.3 Social benefit analysis

11.3.1 The construction project accords with the general planning of Hongya County

The Project is located in the town area of Hongya County. Hongchuan Town Component mainly includes water works and sewage pipe works. The water works is mainly about regulation
of moat in the county and landscaping at the banks, which caters for the requirements for building an urban ecological environment. The sewage pipeline will be laid along the river, and its layout meets the planning requirements and target of improving the urban infrastructure of Hongya County. Liujiang Town Component is an infrastructure construction project, which complies with the general planning of Liujiang Town for future development.

11.3.2 Social and economic benefit analysis

The Project, when completed, will remarkably enhance the regional urban ecological system, improve the infrastructure construction in Hongchuan Town and Liujiang Town, and speed up the tourism development in Liujiang Town in some way. The Project is to improve the landscape along the moat within the urban area of Hongya County, which will largely enrich the regional landscape environment, enhance the attraction of the tail end area of the moat to the citizens in other districts and give an effective push to the local economic development.

Therefore, the Project has remarkable social benefit, and will provide an apparent positive social influence to the social and economic development of Hongchuan Town and Liujiang Town when completed.

11.4 Environmental benefit analysis

11.4.1 Environmental damage caused by the Project

As the Project will occupy barren beach land and rural collective lands, the environmental damage resulted therefrom mainly is land occupation and impact on the ecological environment during the construction period.

(1) Land occupation and ecological damage

The total area of the Project is 30.26hm². The boundary line of land for the Project is within the region of land use stated in the urban construction planning and will not occupy any basic farmland, so no impact will cause to the local agriculture.

Meanwhile, the extensive landscape engineering of the Project will be able to make up the negative environmental impact caused by the construction of the Project.

(2) Impact on and damage to atmospheric environment, acoustic environment and water environment

There will be damage to local ambient air and acoustic environment during the construction period and operation period of the Project. As the land occupied by the Project is land planned for urban construction, its environmental function will change since the progress of urbanization of the planning region, so the damage to ambient air is relatively small, and the loss to local residents also is very little in terms of acoustic environment and water environment.
11.4.2 Negative environmental benefit

(1) Negative benefit during the construction period

Dust, noise and waste water resulted from the excavation, transportation, and transportation and storage of construction materials during the construction period will bring interim adverse impact on the local acoustic environment and ambient air quality, which surely will cause temporary damage to the local ecologic environment. However, such environmental pollution will go off when the construction is over.

(2) Negative benefit during the operation period

When the Project is completed, the negative impact on local environment is mainly due to vehicle noise, vehicle exhaust, and waste water and solid waste from the water treatment plant. By means of analogy analysis, vehicle exhaust can be controlled to meet the emission standard, measures can be taken to make the vehicle noise meet the requirements of relevant standard, and waste water and solid waste from the water treatment plant can be treated effectively during the operation period of the Project. However, this will also cause certain impact on the local environmental quality.

11.4.3 Positive environmental benefit

The Project will bring positive effect to the local landscape environment to some extent. The large scale of landscape along the banks of moat of Hongchuan Town and for the urban Rainwater Garden project of Liujiang Town District will create a better climatic environment for the regions around the Project, and help conserve water in some way. The large scale of landscape will make the local air fresher and improve the urban ecological system.

The sewage pipe works of Hongchuan Town mainly focuses on the collection of combined sewage of old town area alongside the north bank of the moat in the eastern area. The sewage volume expected to be collected is 6200m$^3$/d. Through construction of the project, the scattered drainage problem in the area will be resolved, and the sewage collection rate will rise from 30% to 95%. The amount of COD is expected to be reduced by 0.93kg/d and that of NH$_3$-N is expected to be reduced by 0.087kg/d, which will greatly improve the water environment, effectively safeguard the human health and has significant positive effect on improving the quality of the water environment.

However, water and soil loss may occur during the construction of the Project to some degree; certain vehicle noise, vehicle exhaust, and waste water and solid waste from the water treatment plant will also bring impact on the local environmental quality during the operation period. Necessary measures shall be taken to ease these adverse impacts. Environmental protection measures mainly include enhancing the regulation of vehicle accessing and treating the waste...
water from the water treatment plant reasonably.

(1) Measures taken to prevention pollution to air, water and acoustic environment during the construction: make sure the residents around the Project live in normal order; reduce water and soil loss and damage to vegetations.

(2) Noise control during the operation period: prevent the disturbance of vehicle noise to the surrounding environment; assure a normal accessing of vehicles.

(3) Water environment protection and management during the operation period: treat the domestic and industrial waste water from the water treatment plant reasonably; protect the surface water and maintain its original function.

(4) Solid waste management during the operation period: protect the ecological environment and dispose the solid waste reasonably.

(5) Environmental management supervision: know well the environmental status around the Project, keep the local environmental quality steady and maintain the society, economy and environment develop in a coordinated and sustainable manner.

The Project will bring noticeable social benefit and economic benefit to the development of local national economy, and the ecological environment affected temporarily will be recovered and improved significantly due to the measures taken during the construction period and the implementation of environmental protection measures and the construction of main ecological project.
12.0 Environmental Impact Assessment Conclusion

This project conforms to the national industrial policy and the construction of this project conforms to the master planning in Hongya County and Liujiang Town. After the environmental impact assessment of the project is conducted and the environmental protection measures and soil and water conservation measures proposed in this report are taken, this project will only have a little impact on the ecological environment, water environment and atmosphere and the noise pollution can also be effectively controlled, so, as a whole, the project construction won’t have very obvious impact on the environment. After completion of construction, this project will play an active role in the landscape environment in Hongchuan Town and Liujiang Town, and will bring favorable environmental, economic and social benefits. From the perspective of environmental protection, this project construction scheme is reasonable so the project construction is feasible.