

E4512 v1
REV

Chongqing Small Town Integrated Water Environmental Improvement Project

Comprehensive Environmental Impact Assessment

By: Chongqing Holly Environmental Impact Assessment Co. Ltd

September 2014

Name of Project:

Chongqing Small Town Integrated Water Environmental Improvement Project

Type of Document:

Comprehensive Environmental Impact Assessment Report

EA Agency:

Chongqing Haoli Environmental Impact Assessment Co. Ltd

Legal Representative:

Kang Lin

Task Team Leader:

Kang Lin, Xiang Wei

Task Team Members:

Xiang Wei, Qiu Jianming, Chen Jing, Kang Bin

Preface	8
1 General Introduction	10
1.1 Project Background.....	10
1.2 Brief Description of the Project.....	12
1.3 Objectives of this EIA.....	13
1.4 EIA Category of this Project	14
1.5 Evaluation Methodology	14
1.6 Focus of This EIA	14
1.6.1 Focus of Environmental Assessment on Flood control Component.....	14
1.6.2 Focus of Environmental Assessment on Sewage Collection Component.....	15
1.7 Evaluation Procedures	15
2 Environmental Policies, Laws and Regulations and References for EIA Preparation	17
2.1 Laws and Policies	17
2.1.1 Relevant Domestic Laws and Policies.....	17
2.1.2 Safeguard Policies of the World Bank and EHS Guidelines	20
2.1.3 Assessment Standards	21
2.2 Relevant Plans and Environmental Function Zoning.....	25
2.2.1 Relevant Plans	25
2.2.2 Conformance of the Proposed Project with Relevant Local Policies and Plans	26
2.3 Scope and Factors of Assessment	28
2.3.1 Scope of Assessment	28
2.3.2 Impact Assessment Factors.....	32
2.4 Environmentally Sensitive Spots and Protection Objects	41
3 Project Description	51
3.1 Project Contents	51
3.1.1 Basic Components.....	51
3.1.2 Investment and Fund Sources	51
3.1.3 Construction Period	51
3.1.4 Layout Plan.....	51
3.2 Project Objectives.....	55
3.3 Construction Methods.....	55
3.3.1 Construction Process	55
3.3.2 List of Construction Methods	55
3.3.3 Introduction to Construction Methods	59
3.4 Prediction of Sewage Quantity.....	60
3.4.1 Prediction of Sewage Quantity for Rongchang Component.....	60
3.4.2 Prediction of Sewage Quantity for Shizhu Component	61
4 Overview of Environment	63
4.1 Current Status of Natural Environment	63
4.1.1 Geological Location.....	63
4.1.2 Climate and Meteorology	64
4.1.3 Topography, Landform and Geology	65
4.1.4 Hydrology and Water Conservancy	67
4.2 Current Status of Ecological Environment.....	69

4.2.1	Flora and Fauna.....	69
4.2.2	Soil Conditions and Water Loss and Soil Erosion	79
4.3	Current Social and Economic Status.....	81
4.3.1	Society	81
4.3.2	Industrial Economy	84
4.3.3	Transportation	86
4.3.4	Tourism and Historical and Cultural Sites.....	87
4.4	Current Situation of Sewage Management in Project Area	92
4.5	Current Situation of Flood Control Facilities in Project Area.....	93
4.6	Due Diligences for Relevant Works	94
4.6.1	Due Diligence for Sewage Treatment Plant.....	94
4.6.2	Due Diligence for Sewage Pipe Network.....	97
4.6.3	Due Diligence for Flood Control Works	99
4.6.4	Due Diligence for Sludge Disposal Site.....	100
4.6.5	Industrial Pollution Control in the Project Area.....	103
5	Current Situation of Environment Quality	104
5.1	Noise	104
5.2	Atmospheric Environment.....	106
5.3	Water Environment.....	107
5.4	Quality of Dredging Sludge.....	111
6	Environmental Impact Analysis.....	113
6.1	Experiences and Lessons Learnt from Previous Projects under World Bank Loan in the Project Area	113
6.2	Environmental Impact Prediction and Assessment during Construction	115
6.2.1	Prediction and Assessment of Acoustic Environmental Impact	115
6.2.2	Prediction and Assessment of Impact on Ambient Air Quality	120
6.2.3	Analysis of Impact on Surface Water Environment	124
6.2.4	Analysis of Impact on Ecological Environment	129
6.2.5	Water Loss and Soil Erosion.....	136
6.2.6	Solid Waste.....	137
6.2.7	Social Impact.....	141
6.3	Impact on Environment during Operation.....	142
6.3.1	Surface Water.....	142
6.3.2	Acoustic Environment.....	142
6.3.3	Ecology	144
6.3.4	Landscape.....	144
6.3.5	Flood Release	148
6.3.6	Social Impact.....	151
6.4	Impact on Physical Culture Resources	172
6.4.1	Rongchang Component	172
6.4.2	Tongnan Component.....	173
6.4.3	Pengshui Component.....	174
6.5	Cumulative Impact Analysis	175
6.5.1	Water Environment Problems in Chongqing.....	176

6.5.2	Objectives Proposed in Planning.....	177
6.5.3	Major Measures Proposed in Planning.....	177
6.5.4	Cumulative Impact Analysis	181
7	Mitigation Measures for Environmental Impacts.....	185
7.1	Mitigation Measures for Impact During Design Stage.....	185
7.2	Mitigation Measures for Impact During Construction Stage.....	188
7.3	Mitigation Measures for Impact During Operation Stage	197
8	Impact Analysis of Land Requisition and Resettlement	198
8.1	Project Impact.....	198
8.2	Resettlement Compensation Policy of the Project	198
8.3	House Building Rehabilitation and Re-establishment Plan	199
8.4	Income Recovery Plan	203
8.5	Recovery Plan for the Vulnerable Groups	204
8.6	Total Cost and Implementation Plan	205
8.7	Organizational Responsibilities	206
9	Impact Analysis of Environmental Risks and Dam Safety Evaluation	209
9.1	Environmental Risk Analysis.....	209
9.1.1	Identification of Environmental Risks	209
9.1.2	Analysis on Causes.....	209
9.1.3	Consequence Analysis of Environmental Risks	210
9.1.4	Prevention and Mitigation Measures Against Environmental Risk.....	210
9.1.5	Risk Emergency Preparedness Plan.....	212
9.2	Dam Safety Evaluation.....	213
9.2.1	Conclusions	213
9.2.2	Countermeasures and Recommendations.....	214
10	Alternative Analysis.....	217
10.1	Comparison of “With Project” and “Without Project” Options.....	217
10.2	Comparison of Project Construction Schemes.....	218
10.2.2	Comparison of Schemes for Sewage collection and treatment Works	239
10.4	Comparison of Dredging Schemes	244
10.5	Comparison and Selection of Sludge Disposal Methods	245
11	Public Consultation and Information Disclosure	248
11.1	Purposes of Public Consultation and Information Disclosure	248
11.2	Methods of Public Consultation.....	248
11.3	Summary of Public Consultation, Opinions and Feedback.....	264
11.4	Information Disclosure	275
12	Environmental Management Plan.....	277
12.1	Objectives of Environmental Management Plan (EMP)	277
12.2	Content of EMP	277
12.3	Environmental Management System	277
12.3.1	Environmental Management System during Pre-construction Period of the Project 277	
12.3.2	Environmental Management System during Construction Period.....	278
12.3.3	Environmental Management System during Operation Period	281

12.4	Environmental Management Organizations	284
12.4.1	Environmental Supervision Organizations	284
12.4.2	Environmental Management Organizations	284
12.5	Education Plan for Public Awareness Raising of Environmental Protection.....	290
12.6	Environmental Management Training.....	291
12.6.1	Training Purpose	291
12.6.2	Trainees	291
12.6.3	Training Contents	291
12.6.4	Training Plan.....	291
12.7	Environmental Management Regulations	293
12.7.1	Environmental Management Regulations for Construction Period and Operation Period ..	293
12.7.2	Environmental Management Plan for Sensitive Sites.....	317
12.8	Plan for Environmental, Water and Soil Conservation Monitoring.....	326
12.8.1	Monitoring Purpose.....	326
12.8.2	Monitoring Plan	326
12.9	Social Action Plan	326
12.10	Cost Estimation for Environmental Protection	327
12.11	Environmental Reporting System.....	341
12.12	Public Complaint Mechanism.....	341
13	Conclusions of This EIA	344
13.1	Compliance of the Project with Relevant Policies and Plans	344
13.2	Evaluation of Current Environment Quality.....	345
13.2.1	Current Ambient Air Quality.....	345
13.2.2	Current Water Environment Quality	345
13.2.3	Current Status of Noise Environment Quality.....	345
13.3	Conclusions of Environmental Impact Assessment	345
13.3.1	Impact on Environment during Construction	345
13.3.2	Impacts on Environment during Operation	346
13.4	Measures for Mitigating Environmental Impact.....	346
13.4.1	Measures for Mitigating Negative Impacts during Construction	346
13.4.2	Measures for Mitigating Negative Impact during Operation	347
13.5	Conclusion of Analysis on Environmental Benefits	347
Annex A: Environmental Management Framework for Pengshui Sewage Collection Component.....		349
Annex B: Physical Cultural Resources Management Plan		381
371-382		
Annex C: Project Proposal Approval Documents		
Annex D: Pengshui Component		
Pengshui Attachment 1 Planning Bureau Document on Site Selection		
Pengshui Attachment 2 Review and Approval Document regarding Cultural Relic Protection		
Pengshui Attachment 3 Agreement with Shangtang Water Supply Plant		
Pengshui Attachment 4 Pengshui Water Monitoring Report		
Pengshui Attachment 5 Pengshui Agreement on Spoil Disposal		
Annex E:Rongchang Component		
Rongchang Attachment 1 Agricultural Committee Document		

Rongchang Attachment 2 Review and Approval Documents on Cultural Relic Protection

Rongchang Attachment 3 Monitoring Report

Rongchang Attachment 4 Rongchang Agreement on Spoil Disposal

Annex F: Shizhu Component

Shizhu Attachment 1 Agricultural Committee Document

Shizhu Attachment 2 Forestry Bureau Document

Shizhu Attachment 5 Monitoring Report

Shizhu Attachment 3 Agreement on Sludge Disposal

Shizhu Attachment 4 Agreement on Spoil Disposal

Annex G: Tongnan Component

Tongnan Attachment 1 Review and Approval Document on Site Selection

Tongnan Attachment 2 Land Resources Bureau Document on Pre-review of Land Use under the Project Component

Tongnan Attachment 3 Municipal Water Resources Bureau Document on Review and Approval of Construction relating to River

Tongnan Attachment 4 Municipal Water Resources Bureau Document on Water and Soil Conservation under the Project

Tongnan Attachment 5 Forestry Bureau Document on Its Opinions (regarding Wetland Park)

Tongnan Attachment 6 Reply Document of Tongnan Tourism Bureau

Tongnan Attachment 7 Chongqing Municipal Cultural Relic Administration Bureau Approval Document on Construction relating to Dafo Temple

Tongnan Attachment 8 Reply Document of Tongnan County Agricultural Committee

Tongnan Attachment 9 Review and Approval Document of Tongnan County Government on Adjustment of Water Intake Tongnan

Tongnan Attachment 10 Approval Document of Tongnan County Government on flood control planning

Tongnan Attachment 11 Environmental Quality Monitoring Report

Preface

Chongqing Small Town Integrated Water Environmental Improvement Project (hereinafter referred to as “the Project”) is proposed for use of the World Bank loan to support upgrading flood control standard, reducing discharge of water pollutants, improving surface water environmental quality in the selected small towns and thus promote development of small towns in Chongqing Municipality (hereinafter referred to as “Chongqing”).

The Project consists of 4 components, as shown in the following table (Table 0-1) and the attached map (Attached Map 01).

Table 0-1 Project Components and Distribution

No.	Project Components	Locations	Type of Construction
1	Fujiang River Integrated Water Environmental Protection, Flood and Slope Protection at Dafuba Section of Tongnan County Seat	Tongnan County	Flood Control
2	Laixi River Integrated Improvement in Rongchang County	Rongchang County	Flood Control, Sewage Collection and Treatment
3	Wujiang Riverside Section Flood and Slope Protection in Dianshui New Town of Pengshui County	Pengshui County	Flood Control, Sewage Collection and Treatment
4	Integrated Embankment and Water Environmental Improvement in Longhe District of Shizhu County	Shizhu County	Flood Control, Sewage Collection and Treatment

For the purpose of this EIA, the above mentioned project components are grouped into two categories: flood control and sewage collection and treatment. As such, Tongnan County will only involve in flood control under the Project, while Rongchang, Pengshui and Shizhu counties will implement both flood control and sewage collection activities under the Project.

Feasibility Study Report (FSR) of the project component in Tongnan County was prepared by China Water Pearl River Planning, Investigation and Design Institute Co. Ltd, FSRs for those project components in Rongchang and Shizhu counties were prepared by Chongqing Municipal Investigation and Design Institute for Water & Hydropower Construction, and FSR of the project component in Pengshui County was prepared by Changjiang River Investigation, Planning and Design Institute Co. Ltd.

The Project has been listed by NDRC and MOF as one of the World Bank loan pipeline projects for FY 2013-2015 as per the official document they jointly issued and entitled “ Notification by NDRC and MOF on Proposed World Bank Loan Pipeline Projects for FY

2013-2015” (Document FAGAIWAZI No. (2012) 2208). On June 08, 2013, Chongqing Municipal DRC issued an approval document entitled “Notification on Inclusion of the Project Chongqing Small Town Integrated Water Environmental Improvement Project in the World Bank Loan Pipeline Projects for FY 2013-2015” (Document No.YuFaGaiWai (2013)932) for the proposed project.

In line with relevant domestic laws and regulations on environmental impact assessment and the safeguard policies of the World Bank, Chongqing PMO proceeded to organize EIA preparation for the Project proposed.

In the process of this environmental assessment, activities such as data collection, field surveys to the project ambient areas to understand sensitive environmental impact receptors, identification, screening and categorization of environmental impact factors, two rounds of public consultation and information disclosure, prediction and assessment of environmental impacts, analysis of environmental protection measures and regional cumulative environmental impacts, alternative analysis, analysis of environmental risks and the mitigation measures, and preparation of Environmental Management Plan (EMP) were conducted and, based on which, this EIA was compiled.

1 General Introduction

1.1 Project Background

Located in the southwest part of China and at the center of Changjiang River upstream economic zone, Chongqing is surrounded by two rivers, Changjiang River and Jianling River, and is always called “Capital of Bridges” because of diversified bridges existing within its territory, or “City of Hills” because of its hilly topographic features. Geographically, East Chongqing and Southeast Chongqing border Hubei and Hunan provinces in the south, and West Chongqing and North Chongqing are adjacent to Sichuan Province, Northeast Chongqing is connected with Shaanxi and Hubei Provinces. Chongqing is 470 km long from east to west and 450 km wide from south to north, covering a total area of 82.4 thousand km² and with a total population of 24.95 million. Administratively, it consists of 19 directly administered districts, 15 counties, and 4 autonomous counties.

Small town development is not only the inevitable choice of urbanization process of China, but also the strategic approach to tackle the “three rural issues”, i.e. agricultural, rural and farmers’ issues, or the fundamental issues with regard to Chinese modernization. Compared with developed eastern areas, township enterprises and the closely related small town development in Chongqing started at a later stage. In order for sustainable development, Chinese central government attaches high attention to bridging the rural-urban, regional, and wealth gaps and is now making great efforts to address the related issues, Chongqing is facing the same challenges in its development process. In its on-going West China Development Campaign and the 11th and 12th Five Year Plans, Chinese government consistently gives highest priority to urban-rural integration. In such a context, Chongqing was selected in 2007 by the central government as one of the two pilot cities (Chengdu is the other pilot city) for exploration of innovative and practical approach towards integrated urban-rural development.

In its development strategy of “1 Circle and 2 Wings”, Chongqing established a four-tier urban-rural integration platform system, including one major city central zone (with projected population of 9.3 million in 2020) as the first-tier, 4 regional sub-center cities (with projected population of 500 thousand to 1 million in 2020) as the second-tier, 25 counties (with projected population of 200 thousand to 500 thousand in 2020) as the third-tier, and about 300 small towns in rural area as the fourth-tier. Along with the increasingly fast and greater flow of rural population into urban area, absorption/bearing capacity (to provide jobs and housing for a great amount of residents with transformed status from agricultural to non-agricultural population) of the major city and sub-center cities is relatively limited, hence, Chongqing government needs to rely on the 25 counties (third-tier) to absorb the rural-to-urban migrant population, so as to relieve the great pressure on the first and second tier cities. In accordance with the urban-rural integrated development strategy and urbanization development policies stipulated in its 12th Five Year Plan, Chongqing government has promulgated a series of reform schemes and incentive policies to promote development of the 25 third-tier counties, including relaxing restrictions on census registration and increasing infrastructure investments (highway and high speed rail) and thus employment opportunities in those counties, with the hope that the 25 counties

accommodate one third of its total urban population in the future.

The county towns in Chongqing are usually located in a narrow land plot between rivers/hills, mostly confined by hilly geomorphological conditions and prone to risks of flood, mudflow, water and soil erosion and water pollution. Though great progress has been made over the past years on flood control and disaster reduction in the established areas of these county towns, further upgrading of bearing capacity, including flood control and disaster reducing capacity, is needed in these counties to cope with urbanization development and to protect the ever growing urban population along with rural-to-urban immigration, together with the resulted expansion of residential areas and the newly added industrial zones, so that safe, sustainable development of these counties and their full play in promoting urbanization process of Chongqing as a whole can be guaranteed.

The small towns in Chongqing are scattered in the rural areas, functioning to drive and lead rural development as the head of the rural area and tail of the urban area. They are seeing rapid development and, along with it, rising environmental problems, mainly including lagging behind development of environmental facilities, destruction of human and natural landscapes and etc. Due to one-sided emphasis on economic growth and inadequate attention to environmental protection, a majority of small towns are lacking a complete sewage collection system or being served with a sewage collection system with apparent defects, and arbitrary quarrying and river-straightening are also degrading environmental bearing capacity of the small towns.

As is stated in the “Outline of 12th Five Year Plan (2011-2015) for National Economic and Social Development in Chongqing”, Chongqing shall “accelerate development of small towns with focus placed on central towns of the cities/counties, complete functions of the small towns while properly increasing their size and population”. The 12th Five Year Plan of Chongqing Municipality for Ecological Construction and Environmental Protection” states that “Based on local and development features of the specific small towns, differentiated guidance shall be given to small towns to expedite their preparation and revision of environmental protection plans, so as to enhance environmental protection and ecological construction in the process of small town development. Comprehensive pollution control of secondary rivers should be promoted and integrated measures, including sewage interception and pollution control, river channel dredging and improvement, and ecological recovery and etc., should be taken to achieve the purpose of meeting water quality standards and recovering ecological functions of a river, based on local condition along the specific river section, as well as functions and pollution status of the river”.

Totally 29 secondary rivers in Chongqing are planned to be improved during the 12th Five Year Period. More specifically, 5 rivers (Liangtan, Huaxi, Yipin, Bibei, Dongliang rivers) with the problem of water quality exceeding the standard and 9 black and odorous rivers (Kuxi, Tiaodeng, Daxi, Funiu, Panxi, Qingshuixi, Chaoyangxi, Xiaojia and Tiaodun rivers), all of which are in the central area of the city, are planned to be improved by 2012; and 15 rivers (Zhuxi, Taohua, Pengxi, Laixi, Xiaoanxi, Longxi, Longhe, Wuqiao, Daning, Binan, Linjiang, Jijiang, Daxi (Wulong), Xiaozi, Qiongjiang rivers) in the districts/counties are planned to be improved by 2015. The Project proposed involves Laixi, Longhe, Fujiang and Wujiang rivers.

According to its 12th Five Year Plan, Chongqing adopts overall planning of sewage collection and treatment facilities in urban and rural areas, and is completing sewage collection and treatment facilities in urban areas to ensure 90% of sewage collection and treatment in urban areas. It is also increasing support to construction of suitable sewage collection and treatment facilities in small towns to achieve 75% of sewage collection and treatment there, and promoting sewage collection and treatment in rural areas to achieve 25% of rural sewage collection and treatment.

The World Bank has supported several projects in Chongqing through providing funds for infrastructure development (roads, water supply, flood control, wastewater collection and treatment), vocational education, health care in the small towns and rural areas, all of which have contributed to comprehensive and coordinated reform for overall urban-rural development.

Over the past 6 months, Chongqing municipal DRC, Finance Bureau and PMO had done a lot of preparatory work for preliminary screening of the activities proposed for this Project.

1.2 Brief Description of the Project

The Project consists of 4 components of two categories, flood control and sewage collection.

The project management entity is Chongqing Municipal Management Office for World Bank Loan Funded Urban-Rural Integrated Development and Reform Project (or Chongqing PMO). There are 4 project implementing entities, namely, Tongnan County Longquan Water Conservancy Construction and Development Co. Ltd., Rongchang County Hongyu Water Resources Development Co. Ltd., Pengshui County Hongyu Water Affairs Investment and Construction Co. Ltd., and Shizhu Tujia Autonomous County Urban Construction and Comprehensive Development Co., and the following table (Table 1-1) gives details of the 4 project components.

Table1-1 Summary of the Proposed Project

Abbreviation of Project Components	Project Components	Locations	Project Implementing Entities	Scale of Construction	Categories
Tongnan Component	Fujiang River Integrated Water Environmental Protection, Flood and Slope Protection at Dafuba Section of Tongnan County Seat	Tongnan County	Tongnan County Longquan Water Conservancy Construction and Development Co. Ltd.	Embankment for two sections and slope protection for one section with a total improvement length of 7.89km, total length of embankment line is 6.84km	Flood control
Rongchang Component	Laixi River Integrated Improvement in Rongchang County	Rongchang County	Rongchang County Hongyu Water Resources Development Co. Ltd.	River improvement of 10.3km, construction of embankment of 13.892km, installation of sewage pipeline of about 19 km o.n the left bank, and construction of pump station. a flood diversion sluice at the left barrage of Yushabao power	Flood control, Sewage Collection

				station to be added, in addition to enhancement of the overflow dam at Wanning old town.	
Pengshui Component	Wujiang Riverside Section Flood and Slope Protection in Dianshui New Town of Pengshui County	Pengshui County	Pengshui County Hongyu Water Affairs Investment and Construction Co. Ltd.	Construction of embankment and slope protection of 4.687 m, with road length of 4762 m(8 m wide), construction of sewage collection pipelines ¹ connecting to wastewater treatment plant	Flood control, Sewage Collection
Shizhu Component	Integrated Embankment and Water Environmental Improvement in Longhe District of Shizhu County	Shizhu County	Shizhu Tujia Autonomous County Urban Construction and Comprehensive Development Co.	River improvement for a total length of 4171.37 m, newly construction of embankment for 5216.91 m, green landscapes with area of 57400 m ² , river dredging of 3394.64m , sewage interception pipeline of 11.7 km and rain water collection pipes of 4.4km, in addition to the barrage reconstruction with newly built roads of 1903.90m(with 15.5m wide), and a newly construction of 190.26 m water diversions.	Flood control, Sewage Collection

Note: Due to lack of urban plan of Tongnan County for areas involved in the Project, sewage collection pipeline is not included in Tongnan component.

1.3 Objectives of this EIA

(1) To understand current quality status of natural and social environment in the proposed construction areas and, based on the obtained understanding, to define the impact scope and magnitude of the project and analyze rationality of route/site selection for the construction activities of the project from environmental protection perspectives, so as to provide references for decision-making for the project implementation;

(2) To analyze and demonstrate feasibility and rationality of the construction activities included in the project design, put forward recommendations on measures to mitigate or avert environmental hazards and approaches to enhance or upgrade positive environmental impacts, provide feedback to guide engineering design for synergy of project construction and environmental protection, so as to minimize adverse impact of the project and promote coordinated economic, environmental and social benefits of the project;

(3) To conduct trade-off analysis of the positive and negative impacts of the project, and encourage neighbouring residents to actively participate in project assessment process by

¹ Considering that drainage plan of Pengshui County is not finished yet, scale and location of the wastewater treatment plant and the collection pipeline is still pending, environment management framework is thus prepared and included in this EIA for guidance to preparation of EIA of Pengshui wastewater treatment constructions in line with national and the World Bank's requirements.

means of public survey, information disclosure on newspaper/web, bulletins and notifications, telephone consultation, public consultation meetings and etc., so as to ensure democracy and scientificity of both process and results of the project assessment, while upgrading public awareness of environmental protection and understanding of relevant laws, regulations.

1.4 EIA Category of this Project

As per the TOR for EIA of this project and the minutes of safeguard discussion meeting at PCN stage, EIA of this project is classified as Category-A assessment, or full assessment.

1.5 Evaluation Methodology

- (1) Analogy analysis is applied for ambient air assessment;
- (2) Pattern prediction method is used for water environmental assessment;
- (3) Pattern prediction method is applied for acoustic environmental assessment;
- (4) Surveys and analogy analysis are applied in combination for ecological environmental assessment;
- (5) Surveys and analysis are applied for social environmental assessment and public consultation.

1.6 Focus of This EIA

1.6.1 Focus of Environmental Assessment on Flood control Component

- (1) Adverse environmental impacts due to land occupation, damages to vegetation during project construction period, and the positive impacts during operation period;
- (2) Impacts on Dafu Temple(a national level cultural relic protection site), Wanling ancient town (county level cultural relic protection site), Darong Bridge and Xujiaba Ruins (Chongqing municipal level cultural relic protection sites)during construction period;
- (3) Adverse impacts on fish (spwaning ground) during construction period and the positive impacts during operation period;
- (4) Impacts of construction wastewater and domestic sewage during construction period;
- (5) Impacts of noise sources on acoustic environment during construction period and impacts on occupational health of workers in strong noise environment;
- (6) Impacts of solid waste during construction period;

- (7) Cumulative environmental impacts of the project;
- (8) Analysis of impacts on social-environment;
- (9) Alternative analysis;
- (10) Public consultation and information disclosure;
- (11) EMP of the project component (including Physical Cultural Resources Management Plan);
- (12) Due Diligence (on current status of flood control, layout of waste disposal area).

1.6.2 Focus of Environmental Assessment on Sewage Collection Component

- (1) Impacts on neighbouring sensitive objects during construction period;
- (2) Disposal of construction solid waste and household garbage during construction period;
- (3) Impacts of construction wastewater and domestic sewage from construction camp during construction period, and positive impact of sewage collection and treatment facilities during operation period;
- (4) Alternative analysis;
- (5) Public consultation and information disclosure;
- (6) Analysis of risks relating to sewage leakage during operation period;
- (7) Impacts on public utilities;
- (8) EMP of the project component;
- (9) Due diligence (on wastewater treatment plant, sewage pipeline, sludge treatment and etc.)

1.7 Evaluation Procedures

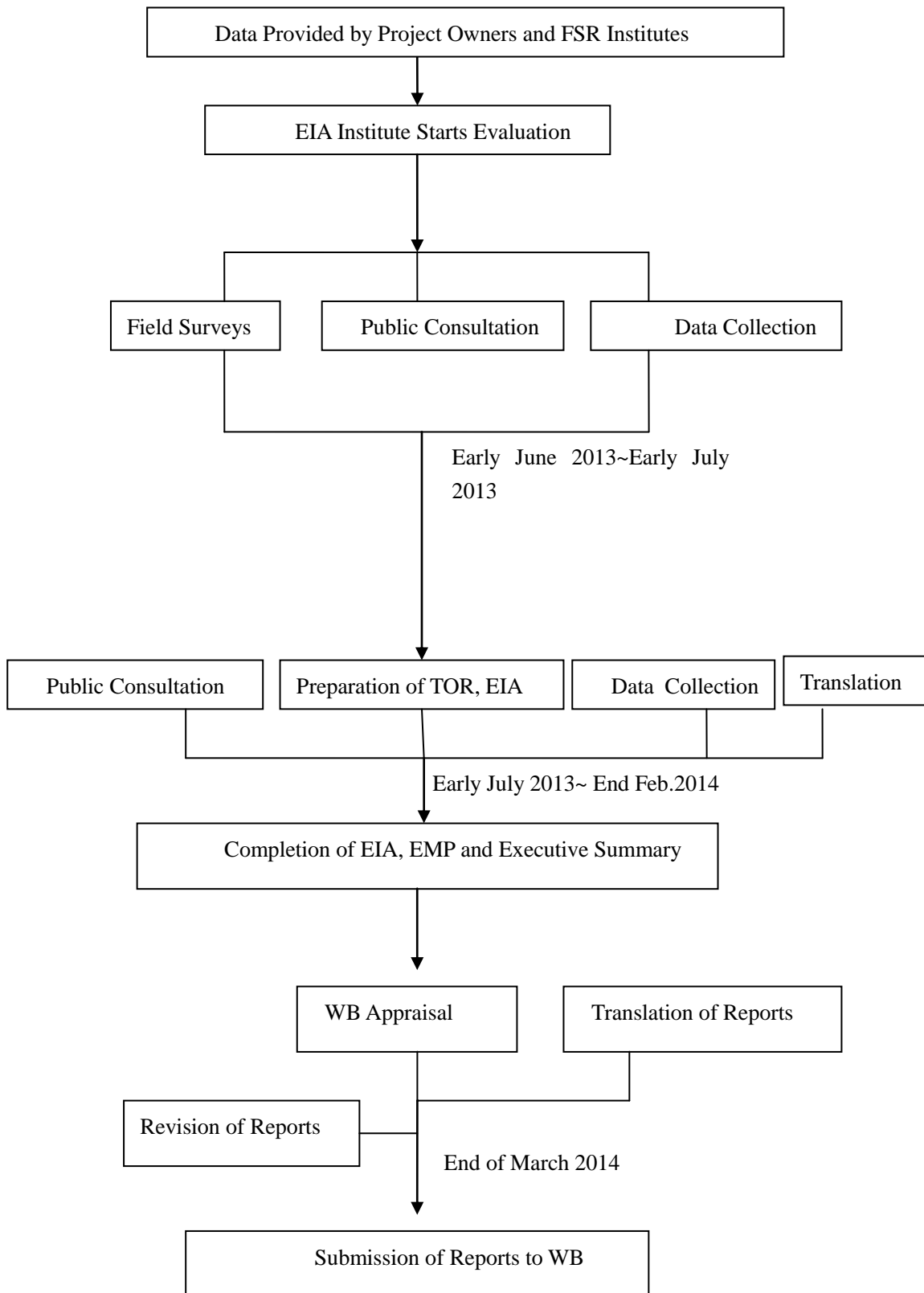


Figure 1-1 Procedures of EIA

2 Environmental Policies, Laws and Regulations and References for EIA Preparation

2.1 Laws and Policies

2.1.1 Relevant Domestic Laws and Policies

2.1.1.1 Laws and Regulations on Environmental Protection

(1) *Environmental Protection Law of the People's Republic of China*, December 26, 1989

(2) *Environmental Impact Assessment Law of the People's Republic of China*, October 28, 2002

(3) Law of the People's Republic of China on Atmospheric Pollution Prevention and Control (April 29, 2000);

(4) Law of the People's Republic of China on Prevention and Control of Ambient Noise Pollution (October 29, 1996);

(5) Law of the People's Republic of China on Water Pollution Prevention and Control (February 28, 2008);

(6) Law of the People's Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (December 29, 2004)

(7) Law of the People's Republic of China on Soil and Water Conservation (December 25, 2010);

(8) Law of the People's Republic of China on Protection of Cultural Relics (Amendment adopted and implemented from December 29, 2007);

(9) Land Management Law of the People's Republic of China (January 1998);

(10) Law of the People's Republic of China on Urban and Rural Planning (October 2007);

(11) Law of the People's Republic of China on Water Pollution Prevention and Control (February 28, 2008);

(12) Law of the People's Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (promulgated by Decree No.31 of the President of the People's Republic of China on December 29, 2004);

(13) Regulations on Environmental Protection of Construction Projects (State Council Decree No.253, issued on November 29, 1998);

(14) Decisions by the State Council on Implementing Scientific Development Perspective and Strengthening Environmental Protection (Document Guo Fa [2005] No.39, December 3, 2005);

(15) Interim Procedures for Public Consultation and Information Disclosure of Environmental Impact Assessment (Document Huan Fa [2006] No. 28 issued by the State Environmental Protection Administration, effective as of March 18, 2006);

(16) Guiding Catalogue for Industrial Restructuring (2011) (amended in 2013);

(17) Regulations of the People's Republic of China on Natural Reserves (State Council Decree No.167, promulgated on October 9, 1994);

(18) Guidance on Environmental Protection of Centralized Drinking Water Sources (for Trial Implementation) (Document HuanBan No.(2012)50);

(19) Regulations of the People's Republic of China on River Channel Management (June 1988);

(20) Regulations of the People's Republic of China on Landscape and Scenic Spots;

(21) Notice on Strengthening Management on Environmental Impact Assessment to Prevent Environmental Risks (Document Huan Fa [2005] No. 152, December 16, 2005);

(22) Water Pollution Prevention and Control Plan for the Three Gorges Reservoir Area and the Upper Stream (Revised Version) (Document No. HuanFa (2008) 16);

(23) Regulations on Protection of Wetlands (Decree No.32 issued by the State Forestry Administration);

(24) Regulations of the People's Republic of China on Natural Reserves (State Council Decree No. 167, October 9, 1994);

(25) Enforcement Regulations on Protection of Terrestrial Wildlife (March 1992);

(26) Enforcement Regulations on Protection of Aquatic Wildlife (September 1993).

2.1.1.2 Local Regulations

(1) Regulations of Chongqing Municipality on Environmental Protection (Amended by the Standing Committee of the People's Congress of Chongqing Municipality in 2010);

(2) Procedures of Chongqing Municipality on Noise Pollution Prevention and Control (Decree of Chongqing Government No.(2013)270);

(3) Regulations of Chongqing Municipality on Water Pollution Prevention and Control for

Changjiang Three Gorges Reservoir Area and the Catchment (effective as of October 1, 2011);

(4) Management Regulations of Chongqing Municipality on Water Conservancy Projects (amended in 2006);

(5) Regulations of Chongqing Municipality on River Channel Management (amended for the second time by the 18th meeting of the Standing Committee of the 3rd People's Congress of Chongqing Municipality on July 23, 2010);

(6) Provisions of Chongqing Municipality on Ambient Air Quality Function Zoning (Chongqing Municipal Government Document No.(2008) 135);

(7) Ecological Function Zoning of Chongqing Municipality (Revised Version) (Chongqing Municipal Government Document No.(2008) 133);

(8) Notification of Chongqing Municipality on Defining Key Control Zone for Water and Soil Erosion (Chongqing Municipal Government Document No.(1999) 8);

(9) Notification of Chongqing Municipal Government on Approval and forwarding of the Adjustment Plan of Surface Water Environment Function Classification (Chongqing Municipal Government Document No.(2012) 4);

(10) Notification of Chongqing Municipal Government on Printing and Distributing the Implementation Plan for the Five Actions for Environmental Protection of Chongqing (2013-2017) (Chongqing Municipal Government Document YuFuFa No.(2013) 43);

(11) Notification of Chongqing Environmental Protection Bureau on Printing and Distributing the Adjustment Plan for Zoning Provisions for Applicable Ambient Noise Standards of Urban Area (Chongqing Environmental Protection Bureau Document YuHuanFa No. (2007) 39);

(12) Notification of Chongqing Environmental Protection Bureau on Relevant Issues regarding the Adjustment Plan for Zoning Provisions for Applicable Ambient Noise Standards of Urban Area (Chongqing Environmental Protection Bureau Document YuHuanFa No. (2007) 78).

2.1.1.3 Technical Guidance for Environmental Impact Assessment

(1) Technical Guidance for Environmental Impact Assessment-General Principles (HJ2.1-2011);

(2) Technical Guidance for Environmental Impact Assessment-Ambient Air (HJ2.2-2008);

(3) Technical Guidance for Environmental Impact Assessment-Surface Water Environment (HJ/T2.3-93);

(4) Technical Guidance for Environmental Impact Assessment-Acoustic Environment (HJ2.4-2009);

(5) Technical Guidance for Environmental Risk Assessment of Construction Projects (HJ/T169-2004);

(6) Technical Guidance for Environmental Impact Assessment-Ecological Impact (HJ19-2011).

2.1.2 Safeguard Policies of the World Bank and EHS Guidelines

(1) Safeguard Policies of the World Bank

The Project mainly involves activities such as construction of embankment, road and wastewater treatment plant, improvement of river channel, and installation of sewage interception pipelines and etc., and relates to cultural relic sites and fish spawning grounds. Given the sensitivity, scope and magnitude of environmental impacts of the Project, Category-A EIA is applicable. Through relevance analysis, safeguard policies triggered by the Project are OP4.01 (Environmental Assessment), OP4.04 (Natural Habitat), OP 4.11 (Physical Cultural Resources), OP 4.12 (Involuntary Resettlement) and OP 4.36 (Safety of Dams), as shown in Table 2-1.

Table 2-1 Relevance of the Project with the Safeguard Policies of the World Bank

No.	The World Bank Safeguard Policies	Whether or Not Triggered	Remarks
1	OP4.01 Environmental Assessment	√	During construction and operation, the project may cause certain impacts on ambient environment, and thus EA is needed and categorized as Category-A based on environmental screening.
2	OP4.04 Natural Habitats	√	Tongnan component relates to Xibutong and Huangjiaotang spawning grounds., Pengshui component may relates to spawning grounds of ordinary fish
3	OP4.09 Pest Management	x	The Project doesn't involve use or storage of pesticides.
4	OP4.10 Indigenous Peoples	x	There are no indigenous peoples living along the construction sites.
5	OP4.11 Physical Cultural Resources	√	Tongnan flood control construction site (sections K6+484~K6+840) is located within Class-2 protection area of Dafu Temple, but outside the Class-1 protection area; Wanling ancient town is located on the right bank of Rongchang project construction site, the right bank of Darong Bridge of Rongchan county is located in the construction area; Pengshui flood control construction will occupy some land within the area of Xujiaba ruins.
6	OP4.12 Involuntary Resettlement	√	The Project involves land acquisition and resettlement.
7	OP4.36 Forestry	x	The Project doesn't involve afforestation or tree cutting, sewage interception pipeline will be installed mainly along the existing roads.
8	OP4.37 Safety of Dams	√	The Project involves Sankuaishi power station dam, Yutan reservoir dam, Wujiang Pengshui hydropower station dam, and Tengzigou reservoir dam.
9	OP7.60 Project in Disputed Area	x	The Project is not within disputed area.

10	OP7.50 International Waterways	x	The Project doesn't involve international waterway.
----	--------------------------------	---	---

(2) EHS Guidelines of the World Bank Group

International Finance Corporation (IFC) Environment, Health and Safety Guidelines (EHS Guidelines), including guiding standards for atmospheric emission, ambient air quality, wastewater, water environment and noise.

2.1.3 Assessment Standards

Comparison between applicable national standards and IFC's EHS Guidelines is carried out in selecting the assessment standards for this EA.

2.1.3.1 Quality Standards

(1) Ambient Air

Since the 4 project components are all located in areas for mixed purposes of rural, industrial and commercial uses, belonging to Class-2 ambient air function zone, thus Class-2 standards in the Ambient Air Quality Standard (GB3095-2012) are applied for the assessment. Table 2-2 includes details of the Class-2 standards and EHS standards for comparison.

Table 2-2 Quality Standards for Ambient Air (Unit: ug/Nm³)

Items	Time Period	Class-2 Standards as per Ambient Air Quality Standards (GB3095-2012)	EHS Standards	Scope of Application
TSP	Annual average	200	—	All project components
	24-hour Average	300	—	
	1-hour Average	—	—	
PM ₁₀	Annual average	70	70	
	24-hour Average	150	150	
	1-hour Average	—	—	
PM _{2.5}	Annual average	35	35	
	24-hour Average	75	75	
	1-hour Average	—	—	
SO ₂	Annual average	60	—	
	24-hour Average	150	125	
	1-hour Average	500	—	
	10min	—	500	
NO ₂	Annual average	40	40	

	24-hour Average	80	—
	1-hour Average	200	200
NO _x	Annual average	50	—
	24-hour Average	100	—
	1-hour Average	250	—

From the above table, it can be seen that EHS standard for 24-hour average SO₂ concentration is stricter than that in the national standards, so the EHS standard is applied for SO₂ while for other pollutant items national standards are applied.

(2) Surface Water

Tongnan flood control construction involves Fujiang River and Class-3 standards in Surface Water Environment Quality Standards (GB3838-2002) are applied for its surface water assessment, and the same standards are applied for surface water assessment for Pengshui flood control construction involving Wujiang River, Rongchang flood control construction involving Laixi River and Shizhu flood control construction involving Longhe River. Table 2-3 that follows gives details of the standards applied.

Table 2-3 Standards for Surface Water Assessment

No.	Items	Unit	Value of Standards	Surface Water Environment Quality Standards Applied	Scope of Application
1	COD _{Cr}	mg/L	≤20	Class-3 Standards as per GB3838—2002	All Flood Control Construction Activities
2	BOD ₅	mg/L	≤4		
3	NH ₃ —N	mg/L	≤1.0		
4	pH	—	6-9		
5	Oil	mg/L	≤0.05		

(3) Acoustic Environment

Of the Acoustic Environment Quality Standard (GB3096-2008), the Class-2 standards are enforced for noise assessment at construction site boundary, the Class-1 standards are adopted for sensitive receptor such as school, and the Class- 4a standards for traffic noise assessment. The following Table 2-4 shows the noise values as per the quality standard and EHS guiding values for noise levels.

Table 2-4 Standards for Ambient Noise Assessment (Unit:[dB(A)])

Acoustic Environment	Classification	Acoustic Environment Quality Standards (GB3096-2008)	EHS Guiding Values for Noise Levels
----------------------	----------------	--	-------------------------------------

		Daytime	Nighttime	Daytime	Nighttime
Construction Site Boundary (Mixed uses of industries and residences)	Class-2	60	50	70	70
Sensitive Sites (schools)	Class-1	55	45	55*	45
Main Trunk Roads	Class-4a	70	55	—	—

Note: *—Residences, offices, education facilities.

As shown in the table, domestic noise level standards for residences, offices, cultural and educational facilities are the same as those in EHS guidelines enforced by World Bank; domestic noise level standards for industrial and commercial facilities are stricter than those in EHS enforced by World Bank; but there is no provision in EHS guidelines as to zones mixed with commercial and residential uses. Therefore, appropriate domestic standards would be enforced for noise assessment of the Project.

2.1.3.2 Standards for Pollutant Discharge

(1) Waste Gas Emission

For waste gas emission during construction period, the concentration limits for fugitive emission monitoring in the Integrated Emission Standard of Air Pollutants (GB16297-1996) are applied in China. See Table 2-5 for details.

Table 2-5 Concentration Limits for Emission of Waste Gas Pollutants

Items	Unit	Concentration limits for fugitive emission monitoring in the Integrated Emission Standard of Air Pollutants (GB16297-1996)	Scope of Application
TSP	mg/Nm ³	1.0	All project components
SO ₂	mg/Nm ³	0.4	
NO _x (NO ₂ Equivalent)	mg/Nm ³	1.0	

(2) Waste Water Discharge

For sewage interception and discharge into wastewater treatment plant, Class-3 Standards in Table 4 of the Integrated Sewage Discharge Standard (GB8978-1996) are applied; for discharge from wastewater treatment plant into surface water environment, Class-1 B standards in the Discharge Standards of Pollutants from Municipal Wastewater Treatment Plant (GB18918-2002) are applied. The limit values stipulated in the Standards are shown in Table 2-6.

Table 2-6 Limit Values for Discharge of Wastewater Pollutants

No.	Items	Unit	Standards for Sewage Discharge into Municipal Wastewater Treatment Plant		Standards for Discharge into Surface Water from Municipal Wastewater Treatment Plant	
			Standard Values	Reference Standard	Standard Values	Reference Standard
1	pH	—	6~9	Class-3 standards in Table 4 of the Integrated Sewage Discharge Standard (GB8978-1996)	6~9	Class-1 B standards in the Discharge Standards of Pollutants from Municipal Wastewater Treatment Plant (GB18918-2002)
2	COD _{Cr}	mg/L	≤500		60	
3	BOD ₅	mg/L	≤300		20	
4	NH ₃ -N	mg/L	—		8 (15)	
5	Oils	mg/L	≤20		3	
6	Animal and Vegetable Oils	mg/L	≤100		3	

(3) Noise Emission Standard

The national standard, the Emission Standard of Ambient Noise at Construction Site Boundary (GB12523-2011) would be enforced for noise during construction period; for standard limit values, refer to Table 2-7.

Table 2-7 Emission Standards for Ambient Noise at Construction Site Boundary

Time Interval	Daytime [dB(A)]	Night Time [dB(A)]	Scope of Application
Standard value	75	55	All project components

During operation period, Class-2 standards of the Standard Limit Values of Noise at Industrial Enterprise Site Boundary (GB12348-2008) will be enforced for noise at boundary of the wastewater treatment plant/pumping station, and Class-4 standards will be applied to noise of main trunk roads. Table 2-8 shows the standard values.

Table 2-8 Standard Limit Values of Noise at Industrial Enterprise Site Boundary

Time Period Acoustic Functioning Zones	Daytime [dB(A)]	Night Time [dB(A)]	Reference Standard	Scope of Application
2	60	50	Standard Limit Values of Noise at Industrial Enterprise Site Boundary (GB12348-2008)	WWTP, Pumping Station
4	70	55		Main Trunk Roads

(4) Solid Waste Standard

For sludge dredging under Shizhou project component, the national standard Standard Values for Control of Pollutants in Agricultural Sludge (GB4284-84) is applied.

Table 2-9 Standard for Solid Waste

Item	Reference Standard	Scope of
------	--------------------	----------

		Application
Sludge Dredging	Standard Values for Control of Pollutants in Agricultural Sludge (GB4284-84)	Shizhu project component

2.2 Relevant Plans and Environmental Function Zoning

2.2.1 Relevant Plans

- (1) The 12th Five Year Plan of Chongqing Municipality for National Economic and Social Development (January 2011);
- (2) The 12th Five Year Plan of Chongqing Municipality for Ecological Development and Environmental Protection;
- (3) The 12th Five Year National Plan for Environmental Protection (December 2011);
- (4) Urban-rural Master Plan of Chongqing Municipality (2007-2020);
- (5) Master Plan of Tongnan County Town Development (2010-2030);
- (6) Flood control Plan for the Fujiang River Section of Tongnan County Town and the review and approval document;
- (7) Master Plan for the National Wetland Park in Chongqing along Fujiang River (2010-2018);
- (8) Master Plan for the Dingming Mountain-Canal Scenic Spot
- (9) Plan for Sand Excavation along Tongnan Section of Fujiang River and the review and approval document;
- (10) Amendments to the Cascade Development Plan of Tongnan Section of Mainstream Fujiang River and the review and approval document;
- (11) Detailed Plan for Dafu Temple Cultural Tourism Scenic Spot Development of Tongnan County;
- (12) Specialized Plan for 12th Five Year Period Sewage Pipeline Construction in the County Town and Key Towns of Tongnan County;
- (13) Urban-rural Master Plan of Rongchang County (2009-2030);
- (14) Master Plan of Lukong Town of Rongchang County (2010-2030);
- (15) Development Plan of Rongchang County for Upper Stream Laixi River from Shabao to Lukong (2011-2030);

(16) Urban-rural Development Master Plan for Pengshui Miao-Tujia Nationalities Autonomous County (2010-2030);

(17) Regulatory Detailed Plan for Dianshui New District of Pengshui County (2010-2020);

(18) Master Plan for the Aquatic Leisure Sport Tourism Area Development along the Wujiang River Gallery in Pengshui County, China (2013-2030);

(19) Urban Development Master Plan of Shizhu County (2005-2020);

(20) Flood control Plan of Chongqing Municipality (2000-2020).

2.2.2 Conformance of the Proposed Project with Relevant Local Policies and Plans

2.2.2.1 Pollution Control Plan for Small Towns in Chongqing Municipality

In the 12th Five Year Plan of Chongqing Municipality for National Economic and Social Development and in the 12th Five Year Plan of Chongqing Municipality for Ecological Development and Environmental Protection, it is stated that “Based on local and development features of the specific small towns, differentiated guidance shall be given to small towns to expedite their preparation and revision of environmental protection plans, so as to enhance environmental protection and ecological construction in the process of small town development. Comprehensive pollution control of secondary rivers should be promoted and integrated measures, including sewage interception and pollution control, river channel dredging and improvement, and ecological recovery and etc., should be taken to achieve the purpose of meeting water quality standards and recovering ecological functions of a river, based on local condition along the specific river section, as well as functions and pollution status of the river”.

The four project components included in the Project aim at integrated improvement of the local rivers and are thus in compliance with the local plans.

2.2.2.2 Compliance of the Project with Local Policies and Plans

The Master Plan of the County Town of Tongnan (2010-2030) positions Tongnan County as “the capital of green vegetables in the west China, new pattern industrial base, famous ecological and cultural city and regional central city”. According to the plan, Tongnan will have a scale of urban land uses reaching 50 km² and a total population of 500 thousand in 2030 , and the overall urban spatial layout of the county town of Tongnan is divided into one ring, one strip and four zones (i.e. old town-Liangfengya zone, Jiangbei new town zone, Dafuba zone and Shuangjiang zone). Under current conditions, along the Dafuba river section some areas planned to be used as ecological green land and residential space as per the county’s master plan are prone to flooding if 1 in 20 year flood happens, making it impossible for the areas to function as planned while causing serious damages to the local ecological environment. Since Dafuba zone is supposed to provide space for urban development and expansion of Tongnan County according to the county’s new master plan,

upgrading its flood control capacity is necessary to meet and guarantee the development requirement of the master plan and, therefore, implementation of the proposed project fits in with the Master Plan of the County Town of Tongnan (2010-2030).

Urban-rural Master Plan of Rongchang County (2009-2030) covers the whole administrative areas of Changyuan Street, Changzhou Street, Guangshun Street, Fenggao Street and Anfu Street, as well as some parts of Wanling Town and Zhisheng Town. As per the plan, Wanling Town is the supplementary zone for central urban function zones, i.e. urban development of the county is planned to expand from the central Changyuan and Changzhou districts towards Wanling town. Under current conditions, if Changzhou district and Wanling town encounter 1 in 20 year flood, some areas for planned urban expansion along Laixi River will be inundated by the flood, and these areas are planned to be used as ecological green land and residential space as per Rongchang County Urban Development Master Plan (2009-2030). If threatened by flood, it will be impossible for the areas to function as planned and serious damages will be imposed to the local ecological environment. Since Changzhou district and Wanling town are supposed to provide space for urban development and expansion of Rongchang County according to the county's master plan, upgrading its flood control capacity is necessary to meet and guarantee the development requirement of the master plan and, therefore, implementation of the proposed project component is in accordance with the master plan of the county.

Urban-rural Development Master Plan for Pengshui Miao-Tujia Nationalities Autonomous County (2010-2030) states that "Flood control capability of the river sections in the county town area should meet relevant requirements stipulated in the National Standard for Urban Flood control (GB50201-94), and improvement of embankments along both banks of Wujiang River and Yujiang River should be conducted gradually in the near term. Discharge system of the drainage and sewage collection and treatment works should be completed and improved, and wastewater treatment plants should be constructed in the new development area while improving sewage collection pipeline network in the old town areas. The proposed project component in Pengshui county, i.e. flood control embankment in Dianshui new district and sewage interception pipeline to match the planned Dianshui New District Wastewater Treatment Plant, will help to upgrade flood control capacity of the new town area and improve regional water environment, therefore, they are in compliance with the Urban-rural Development Master Plan for Pengshui Miao-Tujia Nationalities Autonomous County (2010-2030).

Based on current status of its existing flood control engineering works and in line with its urban development plan, Shizhu county plans to reduce siltation in its river channels and upgrade its flood control capacity, so as to ensure smooth flood discharge to reduce damage and loss caused by flood. The focus of flood control work of Shizhu County during the 12th Five Year period is on both embankment construction in urban and rural areas and strengthening on monitoring and prevention of flood and waterlogging disasters by using various effective measures, aiming at enhanced capacity to respond to abrupt disasters, upgraded safety of people's lives and properties and stable economic development. Included in the proposed project, comprehensive river channel improvement of Shizhou County is in line with the objectives defined in the county's 12th Five Year Plan. After implementation of the Project, water environment along the Longhe River section will have comprehensive

improvement. Additionally, cleaning-up of solid waste along the river banks and vegetation slope protection will help to beautify the landscape along the river, increasing green space and laying a good foundation for development of a resources-saving, environment-friendly society. According to Shizhu Government Document “Opinions of the Office of Shizhu Government on Further Strengthening Town/Township Planning, Construction and Management to Promote Integrated Urban-Rural Development”, in the next years Shizhu County will vigorously implement “Integrated Urban-rural Development Strategy”, after implementation of the project, the towns will not suffer flood damages, people’s lives and properties can be better protected, so that all efforts can be concentrated on economic development and construction of beautiful homeland, ensuring faster and better economic development of the county. Therefore, implementation of the project component is in accordance with requirements of integrated urban-rural development of the county.

2.3 Scope and Factors of Assessment

2.3.1 Scope of Assessment

2.3.1.1 Scope of Assessment for Flood control Construction Activities

(1) Ecological Environment: for terrestrial ecological assessment, 200m along both sides of the embankment, 200m along both sides of the construction sites and temporary construction roads; for aquatic ecological assessment, the area between the upper and lower cascade dams along the river where embankment is planned.

(2) Atmospheric environment: the construction site is linear, the assessment scope is 200m along the edge of the construction site and 50m along both sides of transportation roads, according to the technical guidance for EIA.

(3) Acoustic environment and vibration: since the construction site is linear and there will be no explosion during construction period, the scope of assessment is 200m along the edge of the construction site; physical cultural resources existing within the construction scope include Tongnan Dafu Temple, Rongchang Darong Bridge and Wanling ancient town, Pengshui Xujiaba ruins.

(4) Surface water environment: river section between the upper and lower cascade power station.

To sum up, for the objects of attention identified according to scope of impact, environmental factors, environmental protection objectives and safeguard policies of the World Bank, their scopes of assessment during construction and operation periods are shown in Table 2-10.

Table 2-10 Scope of Assessment for Flood control Constructions

Construction Activities	Scope of Assessment							
	Periods	Ambient Environment	Acoustic Environment, Vibration	Water Environment	Ecological Environment	Social Environment	Natural Habitats	Physical Cultural Resources
Tongnan Flood Control	Construction Period	200m along the edge of the construction site	200m along the edge of construction site	River section from upper stream starting from Sankuaishi power station to downstream at Fujinba navigation hub	200m along the edge of the construction site (incl. spoil site)	Residents, school and etc. along the line and impacted by construction, protection area of Dafu Temple, the national level relic site.	Protection areas of Xibutang spawning ground and Huangjiaotang spawning ground	Protection area of Dafu Temple scenery site
	Operation Period	None	None	None	None	Towns along the line of construction	Protection areas of Xibutang spawning ground and Huangjiaotang spawning ground	--
Rongchang Flood Control	Construction Period	200m along the edge of the construction site	200m along the edge of construction site	River section from upper stream starting from Shabao power station to downstream at Gaoqiao power station	200m along the edge of the construction site	Residents along the line and impacted by construction, protection area of Darong Bridge and Wanling ancient town	None	Protection area of Darong Bridge and Wanling ancient town
	Operation Period	None	None	None	None	Towns along the line of construction	None	--
Pengshui Flood Control	Construction Period	200m along the edge of the construction site	200m along the edge of construction site	River section from upper stream starting from Pengshui Wujiang power station to downstream at Yinpan hub power station	200m along the edge of the construction site (incl. spoil site)	Residents along the line and impacted by construction, protection area of Xujiaba ruins	None	Protection area of Xujiaba ruins
	Operation Period	None	None	None	None	Towns along the line of construction	None	Protection area of Xujiaba ruins
Shizhu Flood Control	Construction Period	200m along the edge of the construction site	200m along the edge of construction site	From upper stream river section starting from Tengzigou power station to downstream at Niulankou power station	200m along the edge of the construction site	200m along the edge of construction site	None	None
	Operation Period	None	None	None	None	Towns along the line of construction	None	None

2.3.1.2 Scope of Assessment for Sewage Collection Construction Activities

(1) Rongchang sewage collection: Construction of sewage collection pipelines of 12.3km and 1 sewage pump station. The pipeline goes through Laixi River twice and ditches three times, and passes through expressway once, county and above county level roads twice, and rural road once.

(2) Shizhu sewage collection: construction of sewage collection pipeline of 14.4 km and 2 sewage pump stations. The pipeline goes through Longhe River once and rural road twice.

To summarize, for the objects of attention identified according to scope of impact, environmental factors, environmental protection objectives, their scopes of assessment during construction and operation periods are shown in Table 2-11.

Table 2-11 Scope of Assessment for Sewage Collection Constructions

Construction Activities	Scope of Assessment						
	Periods	Ambient Environment	Acoustic Environment	Water Environment	Ecological Environment	Social Environment	Physical Cultural Resources
Rongchang Sewage Collection	Construction Period	100m along both sides of pipeline and pump station	100m along both sides of pipeline	Part of water body going through	Along the pipeline: 6m for barren land, 3m for woodland, 0.5m for road	Town area impacted by the pipeline	Protection area of Darong Bridge and Wanling ancient town
	Operation Period	None	200m around the pump station	None	None	Town area served by the pipeline	None
Shizhu Sewage Collection	Construction Period	100m along both sides of pipeline and pump station	100m along both sides of pipeline	Part of water body going through	Along the pipeline: 6m for barren land, 3m for woodland, 0.5m for road	Town area impacted by the pipeline	None
	Operation Period	None	200m around the pump station	None	None	Town area served by the pipeline	None

2.3.2 Impact Assessment Factors

2.3.2.1 Identification of Impact Assessment Factors

(1) Identification of Impact Factors of Flood control Activities

Adverse environmental impacts of flood control activities are mainly occurring during construction period and around the construction site. During construction period, they will cause impacts including social impact, construction dust, transport and piling-up of material, wastewater from construction process, exhaust gas from oil-fueled machines, earth borrowing and spoil (incl. sludge), ecological destruction, water and soil erosion and etc. During operation period, they mainly have positive impacts such as guaranteeing safety of life and property for the people, upgrading land value and promoting small town development along the construction line.

Impacts during construction and operation periods are mainly the following:

① Impacts on Natural Environment

During construction period: Dust from the process of transport, piling-up and use of building material, mixing of concrete, temporary earth borrowing and storage of spoil; odor from sludge during airing and drying process; pollution of waste water from drainage of foundation pit and weir, airing and drying process of sludge, mixing of concrete and etc.; certain impacts of noise of construction machines on residents living in the surrounding area of the construction site.

During operation period: Since the road on top of the embankment is on the sensitive river section, vehicles for transport of toxic, harmful or hazardous matter are not allowed to drive on the road, so there won't be negative impact during operation period.

② Impacts on Ecological Environment

Construction period: Permanent land occupation by project construction will reduce amount of vegetation; construction process and temporary land occupation may destroy terrestrial vegetation; excavation, filling and temporary storage of earth and rock will result in water and soil erosion; river dredging will cause river bed disturbance and uprise of suspended solids in the river at some locations, as well as loss of benthos.

Operation period: The impact include change of hydrological regime after completion of the construction.

③ Impacts on Social Environment

Implementation of the project will surely cause some impacts on social economy of the area with the construction planned, and such impacts include mainly impact of land acquisition during construction, and change of land use nature and promotion to small town development during operation period. Besides, certain adverse impacts on environmental landscapes and cultural relics would be caused; frequent coming and going of the

construction vehicles will cause traffic jam to some extent and thus impact on safety of pedestrians. No use of flammables and combustibles is involved in the construction period, thus there won't be risk of fire explosion. Construction and transport of building material will promote economic development and job enlargement to some extent.

Operation period: Impacts during this period include upgrading flood control level, protection to life and property of people, promotion to small town development. Rapid development of the project area will bring about some indirect impacts, such as demands on infrastructure for transport, sewage, water supply and solid waste services.

Impacts on Physical Cultural Resources: Wanling ancient town (originally called Lukong ancient town) is located in the east of Rongchang county town, about 13km from the county town. The major landmark relics in the ancient town include Darong Bridge, Huguang Club House and Zhao Family Ancestral Temple. Wanling ancient town is at the left bank of Laixi River, on which the embankment was built; Darong Bridge (municipal level cultural relic protection site), a stone arch bridge, spans across Laixi River, no construction is planned on the left bank of the river, while the right bank is within the construction scope. It is understood through consulting relevant administrative departments that Lukong ancient town (incl. Darong Bridge) is valuable in historical, cultural and architecture perspectives. Protection area of Darong Bridge is 2m to both ends of the bridge bank and 15m to upper and downstream of the bridge body.

Dafu Temple in Tongnan County is situated at the foot of Dingming Mountain. On May 25, 2006, Dafu Temple was listed by the State Council into the 6 batch of nationally important cultural relic protection sites. It is understood through consulting relevant administrative departments that Dafu Temple is valuable in historical, cultural and religious perspectives. The planned Dafu embankment is 270m away at the closest distance from the core area of the Dafu Temple protection area, and the embankment section from stake No. K6+596.888 to stake No.K6+840 is located within the landscape coordination area of the rock sculptures of the temple, so the embankment construction is in accordance with the protection plan.

Xujiaba ruins is located in No.3 Villagers Group of Jiangnan Village, Hanjia Town, Pengshui County of Chongqing. In January 2010, it was listed in the 2nd Batch of cultural relic protection sites of Chongqing. According to relevant administrative departments, Xujiaba ruins is valuable in historical, cultural and archaeological perspectives, and it covers an area of about 45,000 m², with a length of about 300m and a width of 150m or so.

Therefore, the project construction may cause the following impacts:

During construction period: The boundary of embankment construction site in Rongchang County is close to Darong Bridge, construction machines may cause vibration to area near the Darong Bridge and there might be some artificial destruction during construction period; Tongnan embankment construction site is far from the Dafu Temple, however, dust, noise and artificial destruction may cause some impacts on the temple; Embankment construction in Pengshui County will occupy some land within the protection area of Xujiaba ruins, and the construction may damage unknown underground cultural relic.

Operation period: The project construction will upgrade flood control level and reduce flood risks to the physical cultural resources.

Impacts on Natural Habitats: Dafuba embankment construction involves two fish spawning grounds, including Xibutang spawning ground located at 400m of east side of the embankment, and Huangjiaotang spawning ground located at 200m upstream of starting river section of the embankment. The spawning grounds are for ordinary fish such as carp, crucian and catfish and etc., all with light sticky eggs, without involving any kind of valuable and rare fish. Pengshui embankment construction involves Wujiang River, a seriously degraded river, where important natural habitat is unlikely, however, spawning grounds of ordinary fish are possible. Though specific locations of such spawning grounds are not yet identified, the construction may impact on them.

To summarize, the project construction will have the following main environmental impacts during construction and operation periods:

- A. On natural environment: Negative impacts by dust, noise, sludge and wastewater from construction process. No negative impact will be caused during operation period.
- B. On ecological environment: Negative impacts such as destruction of vegetation, water and soil erosion and sludge.
- C. On social environment: Promotion to economic development, job enlargement, upgrading of land values; indirect impacts by regional development; impacts by construction vehicles on travel of residents living in the surrounding area of the construction sites.
- D. On physical cultural resources: The impacts include: vibration and artificial destruction caused by construction of Rongchang component; occupation of land in protection area of Xujiaba ruins and potential damage to unknown underground cultural relic during construction of Pengshui component; dust and noise impacts on Dafu Temple during construction of Tongnan component; protection to Darong Bridge and Xujiaba ruins after completion of the constructions.
- E. On natural habitats: Disturbance of construction and artificial destruction during construction period; change of hydrological regime during operation period, and impacts on bottom material of the natural habitats.

Based on the above analyses, the matrix of identified environmental impacts of the flood control construction under the project is prepared as follows (Table 2-12).

Table 2-12 Identified Environmental Impact Factors of Flood control Construction under the Project

Features of Construction Impact Factors		Construction Period							Operation Period	
		Construction	Site Preparation	Transport and Storage of Material	Construction Site	Dredging and Spoil	Wastewater	Noise	Solid Waste	Embankment Construction
Natural Environment	Ambient Air	-○	-☆	-○	-○	-○				
	Surface Water	-○	-○		-○	-○	-○			
	Groundwater						-○			
	Acoustic Environment	-☆	-○	-☆				-☆		
Ecological Environment	Crops			-○		-○				+☆
	Soil	-○	-○				-○		-○	+○
	Ground Vegetation		-☆		-○	-○	-○			+○
	Aquatic Organisms	-☆				-☆		-○	-○	+○
	Xibutang and Huangjiaotang Spawning grounds, and Spawning grounds of Ordinary Fish Pengshui Component May Involve	-☆								-○
Social Environment	Land Use	-☆	-☆	-○	-○				-○	+☆
	Economic Development	+☆		+○						+☆
	Envi. Facility Demand									-☆
	Job Enlargement	+○	+○	+○						
	Living Quality					-○	-○	-○	-○	+☆
	Envi. Landscape	-☆	-☆	-○		-○				+☆
	Health and Safety									+★
	Wanling Ancient Town and Darong Bridge	-☆	-☆	-○		-○				+☆
	Dafu Temple	-☆	-☆	-○		-○				+☆
Xujiaba Ruins	-☆	-☆	-○		-○				+★	

Note: + positive impact; - negative impact; ★ substantial impact; ☆ ordinary impact; ○ slight impact.

(2) Identification of Impact Factors of Sewage Collection Constructions

Sewage collection construction is relatively simple, with adverse environmental impacts mainly concentrated during construction period, and at the same construction site the number of construction workers is smaller, without the need of construction camp. Impacts during construction period include: land occupation, impacts on residents and businesses along the construction line, noise, dust, transport and storage of material, pipe welding, exhaust gas from construction machines, earth borrowing and spoil and etc. There will be minor adverse impacts on ambient air, ground vegetation and residents living close to the construction sites during construction period. Along with completion of construction, these adverse impacts will vanish. During operation, noise of the pump stations will cause some impacts. Although with potential risk of pipe leakage during operation, the project construction will help to reduce direct sewage discharge into environment, so producing mainly positive environmental impact.

Based on above analysis, the matrix of identified environmental impacts of sewage collection construction under the project is prepared and shown as Table 2-13.

2.3.2.2 Screening of Environmental Assessment Factors

(1) Screening of Environmental Assessment Factors for Flood control Construction

Screening of environmental assessment factors for flood control construction is conducted based on the environmental impact factors identified according to pollution sources of the project components, regional environmental features of the construction sites, national and local environmental protection standards, regulations and controlling limits, and requirements of the World Bank. Result of the screening is shown in Table 2-15.

Table 2-13 Identified Environmental Impact Factors of Sewage Collection Construction under the Project

Features of Construction Impact Factors		Construction Period			Operation Period					
		Construction	Site Preparation	Transport and Storage of Material	Exhaust Emission	Wastewater Discharge	Solid Waste	Noise	Risk of Sewage Pipe Leakage	Sewage Collection
Natural Environment	Ambient Air	-o	-o	-o	-☆				-☆	
	Surface Water	-o				-o			-o	+★
	Groundwater					-o			-o	+☆
	Acoustic Environment	-☆	-o	-☆				-☆		
Ecological Environment	Crops	-o	-o						-☆	+☆
	Soil	-o	-o				-☆		-o	+o
	Ground Vegetation		-o							
	Aquatic Organisms					-o			-o	+o
Social Environment	Land Use	-o	-o	-o						+☆
	Economic Development	+☆		+o						
	Job Enlargement	+o	+o	+o						
	Occupational Health	-o	-o		-o	+☆	-☆		-o	+☆
	Living Quality					+☆		-o	-☆	+☆
	Environmental Landscape	-☆	-☆				-o		-o	+☆

Note: + positive impact; - negative impact; ★ substantial impact; ☆ ordinary impact; o slight impact.

Table 2-14 Results of Identified Environmental Impact Factors of Various Project Components

Behaviors That May Impact on Environmental Resources and the Values	Destruction or Benefits to Natural or Social Environment	References for the Impact Analysis	Typical Mitigation Measures	Type of Project Component and Identified Potential Impact Factors	
				Flood control	Sewage Collection
1. Potential Environmental Problems during Construction Period					
Construction site	Land occupation, wastewater, solid waste, impacts on health and ambient environment	Area, purpose and location of the land occupation, and the resulted social and environmental impacts	Reducing land occupation, stipulating obligations of the contractor	√	
Land occupation by temporary piling-up of building material	Impacts on land uses and production	Area, purpose and location of the land occupation	Supervision on construction process	√	√
Clearing-up of vegetation	Destruction to vegetation and cultivated land	Type/area, economic value of destructed vegetation	Method of the clearing-up	√	√
Waste produced during earthwork	Soil erosion and loss of soil nutrient	Location of earth excavation, filling and temporary storage, natural wastewater discharge approach	Stipulating obligations of the contractor (for wastewater discharge and use of sedimentation basin), monitoring	√	√
	Temporary land occupation and damage to water engineering structures	Location, scope and purpose of land occupation	Stipulating contractor's obligation to submit and implement a "Management Plan for Temporary Land Occupation and Water Structures"	√	√
	Sludge and wastewater resulted from river dredging	Amounts of produced sludge/wastewater, location of airing/drying site	Stipulating obligation of contractor (for wastewater discharge and sedimentation basin), monitoring		√
	Dust and other particulate matter emission	Location of and distance to residential area, wind direction	Construction schedule Obligation of contractor(for watering the construction site) Monitoring on earthwork process	√	√
Transport of construction material and equipment	Particulate matter and noise	Particle size of material, volume of transport	Ban on use of open truck for the transport	√	√
Employment of Construction Workers	Employing local laborers to bring direct benefit to local residents	Predict number of workers needed and amount and proportion of use of local laborers	Obligation of contractor (included in EMP), monitoring	√	
	Pollution of domestic wastewater on	Surface water quality, environmental quality	Obligation of contractor to implement EMP	√	

Behaviors That May Impact on Environmental Resources and the Values	Destruction or Benefits to Natural or Social Environment	References for the Impact Analysis	Typical Mitigation Measures	Type of Project Component and Identified Potential Impact Factors	
				Flood control	Sewage Collection
	surrounding surface water body	standard, discharge standard			
Use of large construction equipment	Vibration, noise and exhaust gas impacting on surrounding residents and physical cultural resources	Construction equipment needed, construction operational plan, Distance to close-by residential area and density of residential area Wind direction and speed Noise and exhaust gas emission standards Occupational health	Ban on operation of large construction machine at nighttime Notification to neighboring residents of construction time Selection of low noise equipment Obligation of contractor to implement EMP Monitoring	√	√
Solid waste generated	Pollution to soil and river water	Type and quantity of solid waste: domestic solid waste, construction waste, spoil	Solid waste management and disposal plan Obligation of contractor to implement EMP	√	√
Completion of construction	Construction site left unrecovered	Location and area of temporary land occupation Equipment that may be applied and waste generated	Obligation of contractor to prepare a Construction Site Recovery Plan after Completion of Construction for each individual construction activity Cost for recovery included in the above mentioned plan	√	√
Vibration and artificial destruction	Impact on Darong Bridge and Xujiaba ruins	Construction method	Implementation of EMP		
2. Potential Environmental Problems during Operation Period					
Sewage pipeline (incl. pumps for sewage lift)	Noise	Noise standard Distance to closet residential area Occupational health	Procurement of low noise equipment, strengthening daily maintenance and monitoring		√
	Impact on wastewater discharge	Sewage collection and treatment and discharge arrangement	Sewage collection and treatment measures and wastewater pollutant monitoring		√
	Impact of sludge	Sludge treatment method and disposal arrangement	Solid waste disposal measures		√

Table 2-15 Result of Screening of Assessment Factors for Flood control Construction

Environmental Factors			Construction Discharge Factors	Assessment Factors
Ambient Air	Operation Period	Current Status Assessment	—	Normal Pollutants:SO ₂ , NO ₂ , TSP
	Construction Period	Impact Assessment	Dust	TSP
Surface Water Environment	Operation Period	Current Status Assessment	COD, BOD ₅ , NH ₃ -N, Oils, pH, Total P	COD, BOD ₅ , NH ₃ -N, Oils, pH, Total P
		Impact Assessment		COD, NH ₃ -N
	Construction Period	Impact Assessment	Construction Wastewater	SS
Vibration, Noise	Construction Period	Environmentally Sensitive Site and Operation Workers	Construction machines, transport vehicles	Equivalent consecutive A-noise level
Ecological Environment	Impact Assessment		—	Vegetation, water and soil losses
Solid Waste	Impact Assessment		Construction Period: Building material, temporary storage of earth, earthwork balancing, domestic solid waste, sludge	Construction period: Rationality of temporary storage measures Operation period: Rationality of solid waste treatment and disposal
Social Impacts			Construction period: Living quality of residents along the construction line, impact of land acquisition and relocation Operation period: Increasing economic income, improving employment environment, upgrading women's income, indirect impacts on regional development	Conducting impact analysis
Impacts on Physical Cultural Resources			Construction period: Artificial destruction, vibration, dust, noise Operation period: Flood control	Conducting impact analysis Landscape integrity
Impacts on 3 Fish Spawning grounds			Construction period: Artificial destruction, vibration, sewage Operation period: Change of hydrological regime	Conducting impact analysis according to relevant national guidelines

(2) Screening of Environmental Assessment Factors for Sewage Collection Construction

Screening of environmental assessment factors for sewage collection construction is conducted based on the environmental impact factors identified according to pollution sources of the project components, regional environmental features of the construction sites, national and local environmental protection standards, regulations and controlling limits, and requirements of the World Bank. Result of the screening is shown in Table 2-16.

Table 2-16 Result of Screening of Assessment Factors for Sewage Collection Construction

Environmental Factors	Assessment Factors
Ambient Air	Current Status Assessment
	Normal Pollutants: SO ₂ , NO ₂ , PM ₁₀

Regional Surface Water Environment	Current Status Assessment	COD, BOD ₅ , NH ₃ -N, Oils
Noise	Ambient Noise	Equivalent consecutive A-noise level
	Construction Noise	Equivalent consecutive A-noise level
	Pump Station Noise during Operation Phase	
Ecological Impact	Impact Analysis	Vegetation, water and soil losses
Solid Waste	Analysis of Impact by Solid Waste Disposal	Domestic solid waste
Environmental Risk	Operation Period	Sewage leakage
Social Impacts	Construction period: Business, school and residential area along the street; Operation period: Urban landscape, living quality	Impact analysis

2.4 Environmentally Sensitive Spots and Protection Objects

Based on engineering properties and ambient environmental features, environmental protection objects under the Project are identified and include Dafu Temple, Xibutang fish spawning ground and Huangjiaotang fish spawning ground in Tongnan County; Xujiaba ruins in Pengshui County; Wanling ancient town and Darong Bridge in Rongchang County; residential areas, schools and etc. in the surrounding areas of the construction sites. The environmentally sensitive spots relating to the Project are summarized in Table 2-17, and environmental protection objects for the Project are shown in Table 2-18.

Table 2-17 Environmentally Sensitive Spots

Project Components	No.	Sensitive Factors	Envi. Sensitive Spots	Location	Distance (m)	Quantity	Regional Function and Applicable Standard
Tongnan Flood control	1	Ambient Air	No.1 Villagers Group of Xinsheng Village	1# Construction Site ES	20	3 persons in 1 Household (HH)	Class-2 standards in the Ambient Air Quality Standard (GB3095—1996)
				1# Construction Site E	39.5	4 persons in 1 HH	
				1# Construction Site ES	41.5	3 persons in 1 HH	
				1# Construction Site ES	40.2	8 persons in 2 HHs	
			Yutongwenwu School in Tongnan County	Embankment W	20	165 teachers and students	
	2	Surface Water	Fujiang River	Along construction line	0	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
	3	Noise	No.1 Villagers Group of Xinsheng Village	1# Construction Site ES	20	3 persons in 1 HH	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
				1# Construction Site E	39.5	4 persons in 1 HH	
				1# Construction Site ES	41.5	3 persons in 1 HH	
				1# Construction Site ES	40.2	8 persons in 2 HHs	
		Yutongwenwu School in Tongnan County	Embankment W	20	165 teachers and students	Class-1 standards in Acoustic Environment Quality Standard (GB3096-2008)	
4	Ecology	Fujiang National Wetland Park	--	0	--	Section K6+270~ K6+840 is located in Class-2 protection area of the wetland park as per the wetland park protection plan, belonging to rational use zone of the wetland	
5	Society	Back-up water intake for drinking water supply	Downstream of terminal of the construction project S	750	--	Tongnan county government will move the back-up intake 200m downstream and, after adjustment, the basket will be located outside the Class-1 protection area of the drinking water source	
		Dingming Mountain—Canal Landscape Zone	--	0	--	Section K1+780~ K6+037 is located within Dingming Mountain-Canal Landscape Zone	
Pengshui Flood control	1	Ambient Air	Lingjiang No. 7 Group	1# Construction Site N	40	8 persons in 2 HHs	Class-2 standards in the Ambient Air Quality Standard (GB3095—1996)
			Lingjiang No.8 Group	1# Construction Site N	20	13 persons in 3 HHs	
			Lingjiang No.9 Group	2# Construction Site W	11	7 persons in 2 HHs	
			Zhangjiaba No.5 Group	Starting Point of Construction Project S	21	9 persons in 2 HHs	

Project Components	No.	Sensitive Factors	Envi. Sensitive Spots	Location	Distance (m)	Quantity	Regional Function and Applicable Standard
Rongchang Flood control	2	Surface Water	Wujiang River	--	0	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
			Intake of Shangtang Water Plant	Upstream of Starting Point of Construction Project S	100	Scale 300m ³ /d	Intake of back-up water source of Shangtang Water Plant
	3	Noise	Lingjiang No. 7 Group	1# Construction Site N	40	8 persons in 2 HHs	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
			Lingjiang No.8 Group	1# Construction Site N	20	13 persons in 3 HHs	
			Lingjiang No.9 Group	2# Construction Site W	11	7 persons in 2 HHs	
			Zhangjiaba No.5 Group	Starting point of construction project S	21	9 persons in 2 HHs	
	4	Ecology	Aquatic lives in Wujiang River	--	--	--	To be determined based on consultations with relevant administrative department and aquatic ecologist.
	5	Cultural Relic	Xujiaba Ruins	W	--	--	Occupying about 3200 m ² of protection area of cultural relic
	1	Ambient Air	No.7 Group of Darongzhai Community	Upstream of 1# Construction Site NE	36	3 persons in 1 HH	Class-2 standards in the Ambient Air Quality Standard (GB3095—1996)
					41	4 persons in 1 HH	
					Upstream of 1# Construction Site SE	34.5	
			No.6 Group of Darongzhai Community	Upstream of Right Bank of the Embankment W	11.5	3 persons in 1 HH	
					15.7	7 persons in 2 HHs	
19.5					3 persons in 1 HH		
24.5					3 persons in 1 HH		
35					7 persons in 2 HHs		
35.5					4 persons in 1 HH		
12.5					11 persons in 3 HHs		
No.5 Group of Darongzhai Community			Upstream of 3# Construction Site W	23.7	3 persons in 1 HH		
				Upstream of 3# Construction Site E	24.5	4 persons in 1 HH	
					32.2	3 persons in 1 HH	
No.8 Group of Yuding Village	Upstream of 5# Construction Site N	33.5	4 persons in 1 HH				
No.2 Group of Baochengsi	Upstream of 2# Construction	32	4 persons in 1 HH				

Project Components	No.	Sensitive Factors	Envi. Sensitive Spots	Location	Distance (m)	Quantity	Regional Function and Applicable Standard
				Site W			
			No.1 Group of Baochengsi	Downstream of 3# Construction Site NE	46.5	3 persons in 1 HH	
			No.1 Group of Baochengsi	Downstream of 5# Construction Site N	24	4 persons in 1 HH	
				Downstream of 3# Construction Site SW	26.7	3 persons in 1 HH	
					39.5	7 persons in 2 HHs	
	2	Surface Water	Laixi River	--	0	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
	3	Noise	No.7 Group of Darongzhai Community	Upstream of 1# Construction Site NE	36	3 persons in 1 HH	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
					41	4 persons in 1 HH	
				Upstream of 1# Construction Site SE	34.5	3 persons in 1 HH	
			No.6 Group of Darongzhai Community	Upstream of Right Bank of Embankment W	11.5	3 persons in 1 HH	
					15.7	7 persons in 2 HHs	
					19.5	3 persons in 1 HH	
					24.5	3 persons in 1 HH	
					35	7 persons in 2 HHs	
					35.5	4 persons in 1 HH	
					12.5	11 persons in 3 HHs	
			No.5 Group of Darongzhai Community	Upstream of 3# Construction Site W	23.7	3 persons in 1 HH	
				Upstream of 3# Construction Site E	24.5	4 persons in 1 HH	
					32.2	3 persons in 1 HH	
No.8 Group of Yuding Village			Upstream of 5# Construction Site N	33.5	4 persons in 1 HH		
No.2 Group of Baochengsi Community	Downstream of 2# Construction Site W	32	4 persons in 1 HH				
No.1 Group of Baochengsi Community	Downstream of 3# Construction Site NE	46.5	3 persons in 1 HH				
No.1 Group of Shabao Village	Downstream of 5# Construction Site N	24	4 persons in 1 HH				

Project Components	No.	Sensitive Factors	Envi. Sensitive Spots	Location	Distance (m)	Quantity	Regional Function and Applicable Standard
Shizhu Flood control				Downstream of 3# Construction Site SW	26.7	3 persons in 1 HH	
					39.5	7 persons in 2 HHs	
	4	Cultural Relic	Darong Bridge	--	Within the construction site	--	Municipal level cultural relic protection area
			Wanling Ancient Town	E	20	--	County level cultural relic protection area
	1	Ambient Air	Hongjing Community	2# Construction Site N	16.9	17 persons in 5 HHs	Class-2 standards in the Ambient Air Quality Standard (GB3095—1996)
					24.6	29 persons in 10 HHs	
					34.5	12 persons in 4 HHs	
					45.6	11 persons in 4 HHs	
			Shuangqing Community	4# Construction Site NE	15.6	7 persons in 2 HHs	
					32.6	20 persons in 6 HHs	
41.6					18 persons in 6 HHs		
Hongxing Village	Upstream Embankment Left Bank S	11	6 persons in 2 HHs				
		28.9	11 persons in 3 HHs				
Southwest Liren Hospital	River Section Dredging S	30	80 beds				
2	Surface Water	Longhe River	--	0	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)	
3	Noise	Hongjing Community	2# Construction Site N	16.9	17 persons in 5 HHs	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)	
				24.6	29 persons in 10 HHs		
				34.5	12 persons in 4 HHs		
				45.6	11 persons in 4 HHs		
		Shuangqing Community	4# Construction Site NE	15.6	7 persons in 2 HHs		
				32.6	20 persons in 6 HHs		
				41.6	18 persons in 6 HHs		
Hongxing Village	Upstream Embankment Left Bank S	11	6 persons in 2 HHs				
		28.9	11 persons in 3 HHs				
Southwest Liren Hospital	River Section Dredging S	30	80 beds				
4	Ecology	Longhe River Aquatic Lives	--	--	--	Mainly include commercial fish such as	

Project Components	No.	Sensitive Factors	Envi. Sensitive Spots	Location	Distance (m)	Quantity	Regional Function and Applicable Standard
							carp, crucian, grass carp, without national or municipal level protected fish
Rongchang Sewage Collection	1	Crossing-over Construction	Laixi River	--	0	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
			Ditches	--	0	--	
			G85 Expressway	--	0	--	
			Road at county and above county level	--	0	--	Need consent from relevant department(s)
			Normal rural road	--	0	--	
Shizhu Sewage Collection	1	Noise	Residents	West side of pump station of the Three Gorges Water Affairs Company	10	16 persons in 6 HHS	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
			Residents	South of the sewage pump station of Zhongba Bridge	15	8 persons in 3 HHS	
	2	Crossing-over Construction	Longhe River	--	0	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
			Normal rural road	--	0	--	Need consent from relevant department(s)

Table 2-18 Environmental Protection Objects

Project Components	No.	Sensitive Factors	Protection Objects	Position	Distance (m)	Regional Function and Applicable Standard
Tongnan Flood control	1	Ambient Air	No.1 & 2 Villagers Groups of Xinsheng Village	SE	50~200	Class-2 standards in the Ambient Air Quality Standard (GB3095—1996)
			No.2 Villagers Group of Qianjin Village	SW	100~200	
			No.3 Villagers Group of Shengli Village	W	150~200	
	2	Surface Water	Fujiang River	NW	0	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
	3	Noise	No.1 & 2 Villagers Groups of Xinsheng Village	SE	50~200	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
			No.2 Villagers Group of Qianjin Village	SW	100~200	
			No.3 Villagers Group of Shengli Village	W	150~200	
	4	Ecology	Xibutang Fish Spawning ground	E	400	Ordinary fish spawning grounds

Project Components	No.	Sensitive Factors	Protection Objects	Position	Distance (m)	Regional Function and Applicable Standard
			Huangjiaotang Fish Spawning ground	N	200	
	5	Cultural Relic	Dafu Temple	S	270	National level important cultural relic protection area, Section K6+596.888-K6+840 is located within the coordination area of the environmental landscape, the embankment section is 270m in closest straight-line distance to the core area of Dafu Temple in Tongnan County
Pengshui Flood control	1	Ambient Air	Linjiang No.1 Group	W	80~200	Class-2 standards in the Ambient Air Quality Standard (GB3095 -- 1996)
			Linjiang No.7 Group	W	50~120	
			Linjiang No.8 Group	W	50~100	
			Linjiang No.9 Group	W	50~200	
			Linjiang No.10 Group	W	50~200	
			Zhangjiaba No.5 Group	S	50~200	
			Zhangjiaba No.4 Group	S	50-260	
			Zhangjiaba No.2 Group	S	50-200	
	Binjiang Community	W	50-100			
	2	Surface Water	Wujiang River	--	0	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
	3	Noise	Linjiang No.1 Group	W	80~200	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
			Linjiang No.7 Group	W	50~120	
			Linjiang No.8 Group	W	50~100	
			Linjiang No.9 Group	W	50~200	
			Linjiang No.10 Group	W	50~200	
Zhangjiaba No.5 Group			S	50~200		
Zhangjiaba No.4 Group			S	50-260		
Zhangjiaba No.2 Group			S	50-200		
Binjiang Community	W	50-100				
4	Ecology	Aquatic lives in Wujiang River	--	--	Mainly include commercial fish such as carp, crucian, grass carp, without national or municipal level protected fish or the 3 kind of fish grounds (spawning ground, migration ground, winter ground.)	
5	Cultural Relic	Xujiaba Ruins	N	--	Occupying protection area of cultural relic	
Rongchang Flood control	1	Ambient Air	No.7 Group of Darongzhai Community	SE	80~100	Class-2 standards in the Ambient Air Quality Standard (GB3095 -- 1996)
			No.6 Group of Darongzhai Community	SW	50~150	

Project Components	No.	Sensitive Factors	Protection Objects	Position	Distance (m)	Regional Function and Applicable Standard
Shizhu Flood control			No.5 Group of Darongzhai Community	NE	20~100	
			No.6 Group of Shangshu Community	SE	150~200	
			No.8 Group of Yuding Village	E	90	
			No.4 Group of Shabao Village	NE	150~200	
			No.1 Group of Shabao Village	N	150~200	
				SW	50~200	
			No.2 Group of Baochengsi Community	NE	70~200	
				SW	70~200	
			No.1 Group of Baochengsi Community	SE	100~200	
	E	80~200				
	No.11 Group of Dujiaba Village	SW	180			
	2	Surface Water	Laixi River	--	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
	3	Noise	No.7 Group of Darongzhai Community	SE	80~100	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
			No.6 Group of Darongzhai Community	SW	50~150	
			No.5 Group of Darongzhai Community	NE	20~100	
			No.6 Group of Shangshu Community	SE	150~200	
			No.8 Group of Yuding Village	E	90	
			No.4 Group of Shabao Village	NE	150~200	
			No.1 Group of Shabao Village	N	150~200	
SW				50~200		
No.2 Group of Baochengsi Community			NE	70~200		
			SW	70~200		
No.1 Group of Baochengsi Community	SE	100~200				
	E	80~200				
No.11 Group of Dujiaba Village	SW	180				
5	Cultural Relic	Wanling Ancient Town	S	50~240	County level cultural relic protection area	
		Darong Bridge	--	Within construction site	Municipal level cultural relic protection area	
1	Ambient Air	Chengnan Community	W	50~200	Class-2 standards in the Ambient Air Quality Standard (GB3095—1996)	
		Hongjing Community	E	50~150		

Project Components	No.	Sensitive Factors	Protection Objects	Position	Distance (m)	Regional Function and Applicable Standard
			Hongxing Village	N	50~200	
			Shuangqing Community	S	50~200	
			Shizhu First Vocational School	N	350	
			Chenlin Hope Primary School	E	70	
	2	Surface Water	Longhe River	--	--	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)
			Shuangqing River (branch of Longhe River)	--	--	
	3	Noise	Chengnan Community	W	50~200	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)
			Hongjing Community	E	50~150	
			Hongxing Village	N	50~200	
			Shuangqing Community	S	50~200	Class-1 standards in Acoustic Environment Quality Standard (GB3096-2008)
			Shizhu First Vocational School	N	350	
	Chenlin Hope Primary School	E	120			
	4	Ecology	Longhe River Aquatic Organisms	--	--	Mainly include commercial fish such as carp, crucian, grass carp, without national or municipal level protected fish or the 3 kind of fish grounds (spawning ground, migration ground, winter ground.)
Rongchang Sewage Collection	1	Noise	Residents of No.8 Group of Yuding Village	90~120m North of sewage pump station	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)	
				100m North of sewage pump station		
	2	Surface Water	Laixi River	0	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)	
	3	Crossing-over Construction	Laixi River	0	Need consent of relevant administrative department(s)	
			Ditches	0		
			G85 Expressway	0		
			Road at county and above county level	0		
Ordinary rural road	0					
Shizhu Sewage Collection	1	Noise	Residents	50m North of sewage pump station of the Three Gorges Water Affairs Company	Class-2 standards in Acoustic Environment Quality Standard (GB3096-2008)	
	2	Surface Water	Longhe River	0	Class-3 standards in the Surface Water Environment Quality Standard (3838-2002)	
Shuangqing River			70			

EIA/ Chongqing Small Town Integrated Water Environmental Improvement Project

Project Components	No.	Sensitive Factors	Protection Objects	Position	Distance (m)	Regional Function and Applicable Standard
	3	Crossing-over Construction	Longhe River		0	Need consent of relevant administrative department(s)
			Ordinary rural road		0	

3 Project Description

3.1 Project Contents

3.1.1 Basic Components

Chongqing Small Town Water Environment Improvement Project includes four components, which fall into two categories: flood control and sewage collection and treatment. Tongnan component involves only flood control, while Rongchang, Pengshui and Shizhu components involve both flood control and sewage collection and treatment. Refer to Tables 3-1 and 3-2 for locations, scales, main work contents and other information of the components.

3.1.2 Investment and Fund Sources

Chongqing Small Town Water Environment Improvement Project to be funded using the World Bank Loan involves a total investment of about RMB 1333.5945million, including RMB 300.44. million for Tongnan component, RMB 334.06 million for Rongchang component, RMB 344.0445 million for Pengshui component, and RMB 355.05 million for Shizhu component. The fund for this project comprises of the enterprise's own fund, loan from the World Bank, and loans from commercial banks in China.

3.1.3 Construction Period

Tongnan component has a construction period of 18 months and is planned to commence in September 2014 and be completed in March 2016;

Pengshui component has a construction period of 22 months and is planned to begin in September 2014 and be completed in June 2016;

Rongchang component has a construction period of 24 months and is planned to commence in September 2014 and be completed in August 2016;

Shizhu component has a construction period of 23 months and is planned to commence in August 2014 and be completed in August 2016.

3.1.4 Layout Plan

The layout plan for the project is shown in the figure 16 to figure 22

Table 3-1 Composition of Flood Control Works

Flood Control Works						
Component Name	Location of Construction Site	Main Work Contents				Non-engineering Measures
		Flood control Revetment	Dredging	Ancillary Works	Road at Embankment Crest	
Tongnan flood control	Dafuba District, Tongnan County	The river channel subject to treatment under the Project is 7.89km long. The total length of the embankment works is 6.84 km, including a 1.8 km long section, a 3.24 km long section, and a 1.8 km long intermediate revetment, and 4 drainage box culverts will be installed	None	1.52 km of river side banket	Pedestrian road on the crest of embankment	Construction of flood control and disaster mitigation system, improvement and deployment of monitoring system and warning system, and application of flood risk map
Rongchang flood control	Changzhou Street and Wanling Ancient Town, Rongchang County	The river channel subject to treatment is 10.3 km long, 13892.17 m of embankment, including 6213.686 m long upstream section and 7678.484 m long downstream section. The upstream section of the branch gully is provided with a 1.85 km long drainage ditch, four water logging drainage pipe culverts, and three box culverts, while the downstream section is provided with a 1.20 km long drainage ditch, and a box culvert; a flood-diversion sluice at the left barrage of Yushabao power station to be added, in addition to the enhancement of the overflow dam at Wanning old town.	None	① 5 m wide steps to the river with spacing of about 200~300 m; ② Three landscape bridges	Total length: 13.9 km; width: 4 m	Improvement and deployment of monitoring system and warning system, provision of flood control and emergency tools and equipment, and closure and relocation of local livestock farms

Pengshui flood control	Riverside Section of Wujiang River in Shangtang Cluster and Xujiaba Cluster of Dianshui New Town	The total length of the embankment works is 4.687 km long, including a 0.556 km long section involving Yunxin Company, a 3.068 km long section involving Chongqing-Huaihua Railway Bridge, a 0.709 km long section involving Xujiaba Ruins, and a 0.344 km long section involving Xujiaba Village. The embankment passes through six branch gullies and provided with six embankment-crossing box culverts.	None	None	Road on crest of embankment with a total length of 4.762 km and a width of 8 m	Hydrological monitoring data storage and server construction, and preparation of flood risk map
Shizhu flood control	Urban area along Longhe River in Shizhu County	The river channel subject to treatment is 4171.37m long, in addition to 4836.76m long new embankment. The embankment is provide with nine drainage box culverts at gullies and one pipe culvert. In addition, the retaining tam is subject to be reconstructed (e.g. level 5,4,1,8 is subject to be retrived, while lelel 4 retaining dam will be relocated to 140m upstream of Sizhu Bridge, and the level 2,3,6,7 will be dismantled.)	3394.64m long river channel to be dredged, with a depth of 0.1-0.5m and total dredging amount of 49,000 tons.	38 sets of steps to the river; 2 green landscape sections, with total area of 57,500 m ² and a newly water diversion with a total length of 190.16 m to be costructed.	Road on crest of embankment with a total length of 1.904 km and a width of 15.5 m (including 8 m wide sidewalk)	Application of flood risk map, construction of emergency flood control system, construction and improvement of monitoring system

Table 3-2 Composition of Sewage Collection and Treatment Works

Sewage collection and treatment Works						
Component	Location of Construction Site	Main Work Contents				Scope of Service
		Sewage treatment Plant	Sewage Pipeline Network	Pump Station	Rainwater Pipeline Network	

Rongchang Sewage Collection	Changzhou Street and Wanling Ancient Town, Rongchang County	None	Sewage pipeline works: 19 km	One new sewage lifting pump station about 300 m upstream of Erlangtan Bridge	None	Changzhou Street and Wanling Ancient Town, Rongchang County
Shizhu Sewage Collection	Urban area along Longhe River in Shizhu County	None	Sewage pipeline works: 11.7 km	One reconstruction sewage lifting pump station at the head of Longjing Bridge; one new sewage lifting pump station at Zhongba Bridge	Rainwater pipeline works: 4.4 km	Shizhu County seat
Pengshui Sewage Collection and Treatment	Xujiaba, Dianshui New Town, Pengshui	The Project doesn't include construction of sewage treatment plant (the planned wastewater treatment plant has an expected long-term design capacity of 49,000 m ³ /d and expected near-term design capacity of 24,500 m ³ /d).	The trunk sewer is divided into two sections: the section from the end of the trunk sewer of Dianshui New Town to the start section of the works is about 1.97 km long, and the section from the start section of the works to the planned sewage collection and treatment plant is about 4.69 km long.	None	None	Expectedly, Dianshui New Town and old county town, Pengshui

- 1 Note: As the drainage planning for Pengshui County has not been completed, the size and location of the Pengshui Sewage collection and treatment are uncertain. A separate environmental management framework will be designed Pengshui Sewage collection and treatment Component to guide the preparation and approval of environmental protection documents in the next stage.**

3.2 Project Objectives

The objective of this project is to support upgrading flood control standard, reducing discharge of water pollutants, improving surface water environmental quality in the selected small towns and thus promote development of small towns in Chongqing Municipality.

3.3 Construction Methods

3.3.1 Construction Process

Construction process of flood control works: foundation excavation → placement of concrete toe protection → layered placement and compaction of dike with laying of drainage ditch during compaction → layered placement and compaction of covering weight at dike toe → construction of slope protection works → construction of embankment crest.

Construction process of sewage pipeline network works: excavation and dewatering of pipe trench → installation of pipes → water pressure test → earth backfilling.

3.3.2 List of Construction Methods

All works in the project does not involve blasting. The construction methods and machines to be used are shown in Table 3-3.

Table 3-3 List of Construction Methods

Item	Component Name	Diversion	Construction Method	Construction Process	Construction Materials
Flood Control Works	Tongnan Flood Control Works	The ground elevation at the dike toe along the embankment line for construction is 240m-237m. Compared with the flood surface profile of 3-year flood and the water surface profile in dry period, construction in dry period may eliminate the need to build cofferdam to meet dry land construction conditions for embankment. Adoption of wet-period diversion criteria may eliminate the need to build cofferdam. For flood control during construction period, it is required to build the embankment to the elevation of above the elevation of water surface profile corresponding to 5-year flood, and set opening in the open drainage ditch at low-lying area of the embankment line so that the water in the embankment drops synchronously with the outside river water.	Adoption of wet-period diversion criteria may eliminate the need to build cofferdam. Completion of the part of dike toe and low section of dike below 5-year flood level within a dry period can ensure that the construction all year round will not be affected by external river flood on the whole. It is proposed that the construction is carried out in many sections. As the construction of the protection toe at the side nearer to the river has small interference with the dike body construction, it can be carried out synchronously with the dike body construction.	Excavate earth using bulldozer with excavator, and transport it using dump truck to temporary storage point or filling point; Transport earth and stone using dump truck to the working face and compact them using bulldozer with excavator, with corners compacted using frog rammer. Carry out layered compaction for dike body, with compaction layer thickness not exceeding 1.5 m; Produce precast concrete elements in a precast yard on site and pave them manually; Manually lay other dry-laid rags, masonry, cushion and turf slope protection.	Gravel mixture, pebble and coarse aggregate for concrete required for the works will be purchased from Zhongba lower borrow area; Concrete should be mixed using concrete mixer.
	Rongchang Flood Control Works	The embankment is mainly to be built in dry season. The river channel is wide at present; to reduce cost of diversion works, it is proposed to adopt the diversion mode by using original riverbed for water flowing and longitudinal cofferdam for water retaining.	Diversion for embankment works should be carried out using cofferdam for water retaining and original riverbed for water flowing. The dike foundation should be excavated in sections gradually from top to bottom. To reduce construction intensity, the entire	Adopt layered transverse full-width excavation method for earthwork excavation, and breaking hammer and manual excavation for stone excavation, and use excavator to collect and load materials. Transport spoil to the temporary stockpile according to the material section requirements, and transport excesses to the dump area.	Concrete aggregates will be purchased from Xindianzi, Yongchuan and rags from Gaokan Quarry. Cement, gravel aggregate, stone, commercial concrete, asphalt and others required for the

	<p>Affected by ship lock and Shabu Hydropower Station at the upstream section, the entire embankment section should be built under the protection of cofferdam. For downstream embankment section where the original ground line elevation of foundation is lower than the water level at dry season, construction should be carried out under the protection of cofferdam. For embankment section where the original ground line elevation of foundation is higher than the water level at dry season, excavation should be adopted with earth-stone barriers reserved and original riverbed for water flowing.</p>	<p>works will be constructed in areas and sections based the overall construction schedule. As the shoreline is long, each construction area is divided into several sections to be constructed at the same time.</p>	<p>Transport concrete footing from mixing point to the casting site using 10-15t dump truck and 0.4m³ tip lorry, and place it with chute, and vibrate it with immersion vibrator. Carry out earth and stone compaction and backfilling of the embankment body at the same time for all areas and sections. Transport materials using dump truck and spread them using bulldozer. Conduct compaction using frog hammer, with manual watering and vibrating roller as assistance. Purchase rug and block stones and transport them to each construction point in each construction area using 10-15t dump truck, and transport them to working face using rubber-tired vehicle, and carry them manually to the laying point.</p>	<p>works will be purchased from other area.</p>
<p>Pengshui Flood Control Works</p>	<p>Earth cofferdam is set at the branch gully with open ditch for drainage,the upstream slope side of the cofferdam is provided with riprapping toe protection and the slope surface is provided with riprapping slope protection.</p>	<p>The branch gully is provided with box culvert. The formwork of the box culvert should be erected for reinforced concrete lining construction. The embankment is provided with riprapping toe reinforcement and dry masonry slope protection.</p>	<p>Excavate earth mainly using excavator, with bulldozer for handling. Load spoil using loader directly, with excavator for handling excess spoil. Transport earth using 20t dump truck. For riprapping toe reinforcement, transport rock using dump truck to site, and throw rock directly or pile to the design elevation with manual assistance. For dike and dam backfilling, transport materials using 20t dump truck to the revetment filling point. Spread materials using bulldozer. Adopt layered filling method to uniformly spread earth. After filling, conduct slope-wide compaction and scaling treatment. Roll side slope using 8-12t slope vibrating roller. Lay dry masonry horizontally from top to bottom. Remove loose rocks. For depressed part, excavate it to steps, repair it to the extent that it</p>	<p>It is considered to purchase main materials required for the works such as cement, steel and timber in Pengshui County.</p>

				has the same slope surface as original one, and then start to lay.	
	Shizhu Flood control Works	<p>Diversion should be achieved using cofferdam for water retaining and original riverbed for water flowing. The spoil for diversion cofferdam should be embankment excavations, which should be placed manually in woven bags at river side.</p> <p>Laying of cofferdam part under water using woven bags filled with earth and stone should be carried out using excavator; for cofferdam part above water, the bags should be carried to the construction site and laid manually. Filling of diversion cofferdam should be carried out in sections and alternatively for left and right banks depending on the embankment construction.</p>	<p>Diversion for embankment works should be carried out using cofferdam for water retaining and original riverbed for water flowing. The dike foundation should be excavated in sections gradually from top to bottom.</p> <p>Weir shall be used for dredging (Natural drying of 3 to 5 days after river flow cut-off should be ensured prior to dredging using excavators, and the sludge from dredging can be loaded manually onto vehicles for outward transport.)</p>	<p>Excavate earth using excavator with 15t dump truck for transportation. Excavate stonework using breaking hammer, with manually breaking stone protection layer as auxiliary means.</p> <p>Pre-cast concrete shall be used for slope protection and the stone slabs shall be placed manually. For earth and stone filling, ensure the quality of filling, fill the dike body using the earth and stone materials from excavations and dredging. Excavate materials using 1.6-2.0m³ excavator, transport them using 10-15t dump truck and spread them using bulldozer. Conduct watering manually and roll using 10-16t vibrating roller. Ensure that extra-fill width is not less than 0.3m; roll it using 8-10t slope vibrating roller after scaling.</p>	<p>It is considered to purchase main materials required for the works such as cement, steel and timber in Shizhu County.</p>
Sewage collection and treatment works	Rongchang sewage collection works	<p>It is planned to build a new sewage pipeline of 12.3 km long and a new sewage pump station, with one crossing through G85 expressway, two crossings through highways of above county level, three crossings through rural highways, two crossings over Laixi River, and three crossings through ditches. For crossings through highways of above county level and expressways, adopt crossings by pipe jacking construction technique; for crossings through rural highways, adopt excavation construction technique; for crossings through Laixi River, adopt direct crossing-over construction technique; for crossings through ditches, adopt directional drilling construction technique.</p>			
	Shizhu sewage collection Works	<p>It is planned to build a new sewage pipeline of 12.5 km long, reconstruct a sewage lifting pump station and build a new sewage lifting pump station, with three crossings through rural highways, and one crossing over Longhe River. For crossings through rural highways, adopt excavation construction technique; for crossings through Laixi River, adopt direct crossing-over construction technique.</p>			

3.3.3 Introduction to Construction Methods

During laying of pipelines in the project, direct excavation technique is adopted generally, and crossings include river crossings and highway crossings.

1 Crossing by pipe jacking construction technique

The highway crossings in the pipeline works for the project include crossings through expressways, and highways of county and rural levels. Rural highways are of low pavement grade and low traffic load, for which direct excavation technique is adopted. For highways of high grade, pipe jacking construction technique is adopted. Pipe jacking construction technique has several advantages such as not damaging road, not blocking traffic, small disturbance range, and small environmental impact. Pipe jacking construction technique and construction machines are as follows:

(1) Construction method: setting support and hydraulic jack in the working pit, utilize thrust of the main jacking oil cylinder, pipe-to-pipe thrust, and intermediate jacking thrust to push the pipe or TBM from the working pit through strata to the receiving pit and lift it. Meanwhile, immediately following the pipe or TBM, jack the precast pipe sections into the strata and bury it between the two pits.

(2) Construction machinery: jack head (including small hydraulic jack), hydraulic machine, main jacking oil cylinder, crane (hoist), electrical boxes and other power supply equipment, electrical welding machine, measuring instrument, tubular track, jacking block, and backing.

2 Crossing by directional drilling technique

The rivers involved in crossings of the pipeline works include Laixi River, Longhe River, and ditches along the line. For Laixi River and Longhe River crossings, direct crossing along the existing highway bridges is adopted. For ditch crossing, directional drilling construction technique is adopted. The construction technique features short construction period, small site disturbance, small impact on the surrounding environment, and guaranteed pipe burial depth. The directional drilling construction technique and construction machines are as follows:

(1) Construction method: First, transport equipment to the construction site via existing roads, excavate a mud pit using a drilling machine, meanwhile, mark out the place for major equipment with gray lines, and mobilize equipment and place major equipment in position. Drill guide holes according to the specifications and design requirements, and complete pre-reaming and pipeline pullback construction. After crossing is completed, perform equipment arrangement and site cleanup, drain clear water after mud sedimentation, backfill the mud with earth backfill, and restore the landscape.

(2) Construction machines and materials: drill rig, drill bit, back reamer, drill

pipe and other ancillary equipment, clay, power generator, mixer, and water pump.

3 Excavation

Laying of pipeline by excavation features simple and direct construction, low construction cost, and earth backfill without affect subsequent vegetation restoration and land reclamation. Therefore, excavation is adopted for general lines. For construction by excavation, excavate pipe trench as per the specified plane position and elevation. When excavating a place manually without underground water, reserve 0.05-0.10 m for the trench bottom. When excavating by mechanic means or where underground water exists, reserve at least 0.15m for the trench bottom. Before pipe installation, manually clear the bottom to design elevation and then lay the pipe.

(1) Backfilling of piping trench

To backfill pipe trench, fill the pipe bottom using fine soil, then fill both sides of the pipe at the same time, and after that, backfill the trench to 0.5 m above the pipe top. The backfills for both sides of the pipe and within 0.5 m above the pipe top should not contain gravel, brick, trash or other debris. Frozen soil should not be used as backfill. The backfills should be compacted by layer, with each layer being 0.2-0.3 m thick. The backfills for both sides of the pipe and within 0.5 m above the pipe top should must manually compacted. When backfills exceed the pipe top by 0.5 m, small machine may be used for compaction, with loose soil of each layer being 0.25-0.4 m thick.

(2) Construction machinery

Basic construction machines include excavator, bulldozer, dump truck and shovel for manual use.

3.4 Prediction of Sewage Quantity

3.4.1 Prediction of Sewage Quantity for Rongchang Component

Based on the actual situation of Rongchang County and relevant specifications, it is determined that its population for the near term is 12,000/km². According to the planning, the population in near term is 13,440 for district A (Lukong District), 3,360 for district B (Erlangtan District), 6,900 for district C (Shabu District), and 31,100 for district D (Huangjinbao Cluster).

Based on the actual situation of Rongchang County and relevant specifications, it is determined that the its comprehensive domestic water consumption quota in near term is 200L/d·cap. The scope of sewage collection and treatment for the works does not cover industrial sewage.

The sewage discharge coefficient for the near term is based on 0.80, with sewage collection ratio of 0.90. The prediction of sewage quantity for the works is shown in Table 3-4.

Table 3-4 Prediction of Sewage Quantity for the Work Area

S/N	Area	Average Daily Comprehensive Domestic Water Consumption Quota (L/cap·d)	Served Population (10,000)	Water Consumption (10,000 m ³ /d)	Sewage Quantity (10,000 m ³ /d)
1	District A	200	1.344	0.269	0.194
2	District B	200	0.336	0.067	0.048
3	District C	200	0.69	0.138	0.099
4	District D	200	3.11	0.622	0.448
Total			5.480	1.096	0.789

3.4.2 Prediction of Sewage Quantity for Shizhu Component

For sewage drainage system, it is mainly considered to collect drainage from land under development on both sides of the road to the sewage collection and treatment plant. The scope of service mainly covers three areas.

1) Sections A and B (section from Longhe Bridge to Jiaoshi Stream estuary, and section upstream from Jiaoshi Stream estuary)

These sections are located in Litangba District, Shizhu County. According to *Urban New District Development Plan of Shizhu County*, it is proposed to develop the area into a comprehensive urban area integrating education, scientific research, administration, office, leisure, fitness, living and other functions with sports center, cultural center, Shizhu High School, Longxinhuayang Community as representatives by actively developing culture, education, sports, leisure and living functions and supplementing associated living and service facilities. The land area planned for the near term is about 4.5 km² with population of 40,000.

2) Sections C and D (Section from Sanjiao Temple to Longhe Bridge, and Section from Longhe Bridge to Shanxiashuiwu Sewage Pump Station at Longjing Bridge)

The service scope of the sewage pipeline covers residents living along the mountain from Sanjiao Temple to Longjing Bridge, and it is planned for population of 12,000 in the near term.

3) Section E (section from Niushiqian River estuary to Qiaotou Yard)

The service scope of the sewage pipeline covers residents living from Niushiqian

River estuary to Qiaotou Yard, and it is planned for population of 15,000 in the near term.

4) Section F

The service scope of the sewage pipeline covers residents living upstream from Zhongba Bridge at the right bank of Longhe River, and it is planned for population of 19,000 in the near term.

Based on the actual situation of Shizhu County and relevant specifications, it is determined that the quota for its comprehensive domestic water consumption in near term is 200L/d-cap. The sewage discharge coefficient for the near term is based on 0.80, with sewage collection ratio of 0.90. The prediction of sewage quantity for the works is shown in Table 3-5.

Table 3-5 Prediction of Sewage Quantity for the Work Area

S/N	Area	Domestic Water Consumption Quota (L/cap·d)	Served Population (10,000)	Water Consumption (10,000 m ³ /d)	Sewage Quantity (10,000 m ³ /d)
1	Litangba District	200	4	0.800	0.576
2	Section from Sanjiao Temple to Longjing Bridge	200	1.2	0.240	0.173
3	Section from Niushiqian River estuary to Qiaotou Yard	200	1.5	0.300	0.216
4	Section upstream from Zhongba Bridge at the right bank of Longhe River	200	1.9	0.380	0.274
Total			8.6	1.720	1.238

4 Overview of Environment

4.1 Current Status of Natural Environment

4.1.1 Geological Location

Chongqing lies at the transition zone between Tibet Plateau and Middle-Lower Yangtze plains. Located in Southwest China and upper reaches of the Yangtze River, between latitude 28°10' to 32°13' N and longitude 105°11' to 110°11' E, Chongqing neighbors Hubei, Hunan, Guizhou, Sichuan and Shaanxi.

As China's largest municipality directly under the central government, Chongqing is a clustered city combining big city, large rural area, large mountainous area, and large reservoir area. The municipality has jurisdiction over 38 districts and counties (autonomous counties) such as Yuzhong District, Dadukou District, Jiangbei District, Shapingba District, Jiulongpo District, Nan'an District, Yubei District, Ba'nian District, Beibei District, with a total population of 29.45 million. The municipality reaches a maximum width of 470 km from east to west and a maximum length of 450 km from north to south, with a total area of 82,400 km², which is 0.86% of the total area of China.

Refer to Table 4-1 for the districts and counties where Chongqing Small Town Water Environment Improvement Project under World Bank Loan lies and its geographic location.

Table 4-1 Districts and Counties Where Chongqing Small Town Water Environment Improvement Project under World Bank Loan Lies and Its Geographic Location

Components		District/County	Geological Location
Component s	Laixi River Integrated improvement Works in Rongchang County	Rongchang County is located in the western Chongqing, bordering Dazu District and Yongchuan District on the east, Longchang County (Sichuan) on the west, Luzhou City (Sichuan) on the south, and Neijiang City and Anyue City (Sichuan) on the north.	The component is divided into two sections. The upstream section starts from the Rongchang-Dazu boundary and ends at the tributary of Beilou River at Erlangtan Bridge. The downstream section starts from the damsite of Shabu Hydropower Station and ends at Liansheng Bridge.
	Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu	Shizhu Tujia Autonomous County is located at the south bank of the Yangtze River in southeastern Chongqing, bordering Lichuan City (Hubei) on the east, Pengshui Tujia and Miao Autonomous County on the south, Fengdu on the southwest, Lianzhong County on	The component is divided into two sections. The upstream section starts from Wuyangba and ends at Longhe Bridge. The downstream section starts from Qishan Bridge and ends at Zhongba Bridge.

	County	the northwest, and Wanzhou District on the north.	
	Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Pengshui Tujia and Miao Autonomous County is located in southeastern Chongqing and at the lower reaches of Wujiang River. It borders Hubei on the north, Guizhou on the south, and neighbors Youyang County, Qianjiang District, and Wulong District.	The component starts from Shangtang and ends at Xujiaba.
	Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County	Tongnan County is located in northwestern Chongqing, bordering Hechuan District on the east, Tongliang County and Dazu District on the south, Anyue City (Sichuan) on the west, and Suining (Sichuan) on the north.	The component starts from the external wall of the pump station management area of Hongyanzui Irrigation Zone, and ends at the road side at left bank of Shengli Channel of Shengli Village Group 1.

4.1.2 Climate and Meteorology

Chongqing has a subtropical monsoon climate, with average annual temperature of 16-18°C, average temperature in the hottest months of 26-29°C, and average temperature in the coldest months of 4-8°C. Chongqing has rich average annual precipitation, which is 1000-1350 mm for most places. Its precipitation is concentrated in May to September, about 70% of the total annual precipitation. As a high humidity area in China, Chongqing has annual average relative humidity of mostly 70%-80%. As one of the regions with the lowest sunshine in China, Chongqing has annual sunshine duration of 1000-1400 hours, with sunshine percentage of only 25% -35%.

Refer to Table 4-2 for meteorological conditions at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-2 Meteorological Conditions at the Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

Factor	Rongchang County	Shizhu County	Pengshui County	Tongnan County
Average wind speed (m/s)	1.2	1.0	1.1	0.8
Maximum wind speed (m/s)	9.4	12.0	12.8	0.9
Average temperature (°C)	17.8	16.4	17.5	17.5
Extreme maximum temperature (°C)	41	40.2	44.1	40.8
Extreme minimum temperature (°C)	-3.4	-4.7	-3.8	-2.5
Average relative humidity (%)	81	79	80	84
Average precipitation (mm)	1089.2	1109	1104.2	969.2
Maximum precipitation (mm)	1578.5	1701.2	1600.9	1495.8
Minimum precipitation (mm)	688.3	760.2	912.5	637.5
Sunshine duration (h)	1105	1230	1196	1184
Annual prevailing wind direction	NNE	WNW	NE	NW

4.1.3 Topography, Landform and Geology

Chongqing lies at the southeast edge of Sichuan Basin, with the Daba Mountains on its north, and the Wuling Mountains on its southeast, hills on its northwest and low mountains in its central part. The area rises and falls with the rivers and mountains. It is high in the north and south and low in the center, and slopes down from north and south towards the Yangtze River valley. These form its landform that is dominated by mountains and hills. The general features of Chongqing's landform are: (1) sharp rises and falls with obvious stratified landform; (2) various topographies, which are dominated by mountains and hills; (3) obvious differentiation between regions with topography combination; (4) Widespread distribution of karst topography.

Refer to Table 4-3 for topography, landform and geology at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-3 Overview of Topography, Landform and Geology at Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

Category	Component			
	Laixi River Integrated improvement Works in Rongchang County	Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County
Landform and topography	The work site is located at the southeast wing of Luoguan Mountain anticline, with hilly valley landform.	The work site is located in intermountain valley, with geomorphic unit of tectonic denudation - erosion valley. The embankment works are located on the slope of Longhe River bank.	The work site has generally gentle landform, with V-shape gully trending substantially vertical to Wujiang River.	The work site has gully terrace topography and the terrace is mostly grade I terrace formed by river erosion, cut-through and alleviation.
Geology	The work site mainly has exposed Jurassic and Quaternary strata.	The work site has stone and soil that mainly include Quaternary Holocene artificial plain fill, Quaternary alluvial-proluvial, and underlying bedrock of middle Jurassic sandstone and mudstone.	The work site mainly has exposed marlstone, shale, mudstone and siltstone of Middle Triassic Leikoupo Formation.	The work site mainly has exposed interbedded sandstone and mudstone of upper Jurassic Suining Formation and Middle Jurassic Shaximiao Formation, Quaternary Holocene alluvium and artificial fill layers, and Quaternary Pleistocene alluvium layer.

4.1.4 Hydrology and Water Conservancy

The rivers flowing through Chongqing mainly include Yangtze River, Jialing River, Wujiang River, Fujiang River, Qijiang River, Daning River, Apeng River, and Youshui River. The main stream of Yangtze River runs through the whole area from west to east, covering a course of 665 km, cutting through the Wu Mountains at three anticlines and forming the well-known Three Gorges: the Qutang, the Wuxia and the Xiling gorges (the last one is located in Hubei). Jialing River joins Yangtze River in Yuzhong District, while Wujiang River joins Yangtze River in Fuling District.

Refer to Table 4-4 for overview of hydrology and water conservancy at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-4 Overview of Hydrology and Water Conservancy at the Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

Category	Components			
	Laixi River Integrated improvement Works in Rongchang County	Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County
Hydrology and water conservancy	Laixi River is a level I tributary of the Tuojiang River. It is originated in Dazu District, Chongqing, flows via Qingjiang County to Luxian County, Sichuan, where it joins Tuojiang River. Laixi River has a total length of 192 km, basin area of 3257 km ² , average annual runoff of 10.71 m ³ /s, maximum runoff of 22.0 m ³ /s, and maximum peak discharge of 2910 m ³ /s which occurred in 1873.	Longhe River is a level I tributary of Yangtze River at its right bank. It is originated in Shizhu County, Chongqing, and joins Yangtze River near the new town of Fengdu County. Longhe River has a total length of 161 km, basin area of 2810 km ² , average annual runoff of 20.15 m ³ /s, maximum runoff of 40.7 m ³ /s, and maximum peak discharge of 3960 m ³ /s which occurred in 1912.	Wujiang River is a level I tributary of Yangtze River at its right bank. It is originated in Shuiying and Yancang area at the foot of Wumeng Mountain in Guizhou, and joins Yangtze River in Fuling District. Wujiang River has a total length of 1053 km, basin area of 87920 km ² , average annual runoff of 1108 m ³ /s, maximum runoff of 2677 m ³ /s, and maximum peak discharge of 31000 m ³ /s which occurred in 1830.	Fujiang River is a tributary of Jialing River and level II tributary of Yangtze River. It is originated in Minshan Mountain in Sichuan, and joins Jialing River in Hechuan District. Fujiang River has a total length of 670 km, basin area of 36400 km ² , average annual runoff of 572 m ³ /s, maximum runoff of 1140 m ³ /s, and maximum peak discharge of 36600 m ³ /s which occurred in 1782.
Cascade hydropower station	Three cascade hydropower stations exist on Laixi River. The project river channel is between Shabu Hydropower Station and Gaoqiao Hydropower Station.	Four cascade hydropower stations exist on Longhe River. The project river channel is between Tengzigou Hydropower Station and Niulankou Hydropower Station.	11 hydropower complexes are planned on Wujiang River, among which Pengshui, Yinpan and Baima hydropower complexes are in Chongqing, while the other eight are in Guizhou. The project river channel is between Pengshui Hydropower Complex and Yinpan Hydropower Complex.	Nine hydropower complexes exist on Fujiang River. The project river channel is between Sankuaishi Hydropower Station and Fujinba Navigation and Hydropower Complex.

4.2 Current Status of Ecological Environment

4.2.1 Flora and Fauna

4.2.1.1 Terrestrial Flora and Fauna

Chongqing has more than 2,000 kinds of vascular plants. Jinyun Mountain still retains redwood known as "living fossil" that has existed since 160 million years ago, *bretschneidera sinensis* Hemsl., *acer oblongum* and other rare plants in the world. Jinfoshan National Nature Reserve in Nanchuan has more than 30 rare tree species (of which three are national class I protection species), 1000 kinds of arbor, 17 kinds of bamboo, especially silver fir, rhododendron king, large-leaf tea, and square bamboo shoot, which are well known in the world as "Four unique plant species of Golden Buddha Mountain ". There are 380 kinds of animal resources in Chongqing, among which are rare wild animals, mainly including *elaphodus cephalophus*, *moschus berezovskii*, large Indian civet, otter, *neofelis nebulosa*, macaque, *chrysolophus pictus*, etc.

The sites of the four components of Chongqing Small Town Water Environment Improvement Project under World Bank Loan have been developed by human beings, and are generally covered by crops, with common grass at river bank. The project area is heavily affected by human activities, with poultry and livestock dominated terrestrial animals and no large wild animals. The project does not involve the above rare terrestrial flora and fauna.

4.2.1.2 Aquatic Flora and Fauna

Many cascade hydropower stations are distributed on the rivers involved in the project, which results in a fragmentation of river ecology and seriously changes the original natural habitat. Refer to Table 4-5 for main aquatic flora and fauna at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-5 Aquatic Flora and Fauna at the Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

Component		Flora and Fauna
Component	Laixi River Integrated improvement Works in Rongchang County	(1) Zooplankton: 10 families, 16 genera, and 23 species. (2) Zoobenthos: 8 species. (3) Phytoplankton: 4 phyla, 14 families, and 22 species. (4) Common economic fish in subject river channel: 10 species, with cyprinidae dominant. According to the investigation, the project river channel has no national rare and endangered fish and does not involve fish spawning grounds, feeding grounds, and wintering grounds ("Three Grounds").
	Longhe Urban Embankment	(1) Zooplankton: 3 genera and 9 species. (2) Zoobenthos: 6 species. (3) Phytoplankton: 5 phyla, 17 families, 26 genera, and 40 species.

and Water Environment Integrated improvement Works in Shizhu County	(4) Fish in subject river channel: 11 families and 50 species. According to the site investigation and documents from the Council of Agriculture (COA), the subject area has no rare and endangered fish, distribution of Chongqing's key protection fish and migratory fish, and does not involve the natural spawning grounds, feeding grounds, winter grounds and migration channels of important aquatic organism, or large scale fish farms.
Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Based on data available, in this section there are neither rare fish in the main stream of Wujiang River, nor the spawning ground, feeding ground, winter ground and migration channels of important aquatic organism. Aquatic investigation will be conducted as defined in the Environmental Management Framework for Sewage Collection and Treatment Construction in Pengshui County, so as to help in designing the wastewater treatment plant and discharge outlet, as well as preparation of environmental assessment report if necessary.
Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County	(1) Zooplankton: 22 species. (2) Zoobenthos: 10 species (genera). (3) Phytoplankton: 4 phyla, 21 families, 30 genera, and 61 species. (4) Fish in subject river channel: 5 orders, 13 families, and 50 species; no national protection fish, 1 species (<i>procypris rabaudi</i>) is Chongqing's class II protection creation. The project river channel involves two spawning grounds.

According to Table 4-5, the project river channel in Rongchang component and Shizhu component do not involve national rare and endangered fish, Chongqing's key protection fish and migratory fish, or spawning grounds, feeding grounds, and winter grounds of fish. The rare fish in the main stream of Wujiang River and the spawning grounds, feeding grounds, winter grounds and migration channels of important aquatic organism, or large scale fish farms in the main stream of Wujiang River (Pengshui component involved section) are not certain, as detailed in environmental management plan. The following part will focus on spawning grounds of the "Three Grounds" and Fujiang River National Wetland Park related to Tongnan component.

(1) Investigation into fishes in Fujiang River for Tongnan component

According to historical records, the Tongnan section of Fujiang River has 111 fish species of fish, belonging to 5 orders, 13 families, and 61 genera. Due to the blocking effect of the downstream Fujinba and other navigation and hydropower

complexes, according to Southwest University's statistics of the fish catch from the lower reaches of Fujiang River during 2004-2007, combined with monitoring data on fish catch provided by Tongnanxian Fishery Management Station, the Tongnan section of Fujiang River has 50 fish species, belonging to 5 orders and 13 families.

According to the investigation into the river section by Southwest University from 2009 to October 2010, 21 fish species were collected.

Table 4-6 Composition of Fish Species in Tongnan Section of Fujiang River

Order	Family	Number of Species	Order	Family	Number of Species
Cypriniformes	Cyprinidae	34	Cyprinodontiformes	<u>Cyprinodontidae</u>	1
	Balitoridae	1	Synbranchiformes	Synbranchidae	1
	Cobitidae	2	Perciformes	Serranidae	1
Siluriformes	Bagridae	3		Eleotridae	1
	Amblycipitidae	1		Gobiidae	1
	Siluridae	2		Lacepede	1
	Sisoridae	2			

1) Groups of fish fauna

The fish fauna in Tongnan Section of Fujiang River include four groups and have the characteristics of the fish fauna in the upper reaches of Yangtze River. The main fish is East Asian plain group of cyprinidae, followed by sub-tropical fish and bagridae.

① River plain group includes: 33 kinds such as siluriformes and cypriniformes xenocypris, paradise fish, bleak fish, leuciscus, gudgeon and other subfamilies, accounting for 64.7% of the total number of fish kinds in this river system.

② Southern subtropical group: includes 9 kinds such as barbinae and bagridae species, medaka, monopterus, hypseleotris swinhonis, and ctenogobiusgiurinus, accounting for 18% of the total number of fish kinds in this river system.

③ Paleogene group: includes 5 kinds such as cyprinus carpio, carassius auratus, catfish, and squaliobarbus curriculus, accounting for 9.9% of the total number of fish kinds in this river system.

④ West China mountainous area group: includes small fishes suitable to live in rapids, which are in four kinds in balitoridae, sisoridae, amblycipitidae, and bagridae, accounting for 8.0% of the total number of fish kinds in this river system.

2) Analysis of resource attributes

Based on the protection level, endangerment condition, extent of uniqueness, size of population, and economic value of the endangered fishes, the fishes in this section of the river is divided into the following types. Refer to Table 4-7 for each fish type.

Table 4-7 Type of Fish Resources in Tongnan Section of Fujiang River

Type of Source	Fish Name	Number of Species
Chongqing's key protection fish	<i>Procypris rabaudi</i>	1
Endemic fish in upper reaches of Yangtze River	<i>Rhinogobio ventralis</i> , <i>procypris rabaudi</i> , and <i>sinilabeo rendahli rendahli</i>	3
Mainly economic fishes	<i>Ctenopharyngodon idella</i> , <i>hypophthalmichthys molitrix</i> , <i>hypophthalmichthys nobilis</i> , <i>cyprinus carpio</i> , <i>carassius auratus</i> , <i>Silurus meridionalis</i> , <i>leiocassis longirostris</i> , <i>mystus macropterus</i> , <i>spinibarbus sinensis</i> , <i>onychostoma angustistomata</i> , <i>rhinogobio ventralis</i> , <i>erythroculter ilishaeformis</i> , <i>xenocypris davidi</i> , <i>siniperca chuatsi</i> , etc.	14
Others	Catfish, <i>pseudolaubuca sinensis</i> , <i>misgurnus anguillicaudatus</i> , <i>monopterus</i> , <i>rhinogobio typus</i> , <i>hemibarbus maculatus</i> , <i>hemiculter leucisculus</i> , etc.	32

3) Analysis of ecological groups

The subject river section is a class II tributary of Yangtze River section belongs, with the fish community composition characteristics in the upper reaches of Yangtze River. Originally, fishes adapted to flowing water or rapids and benthic living and feeding on benthic invertebrates are dominant and represent large proportion. However, due to the blocking by Weituo Hydropower Station and Fujinba Navigation and hydropower Complex in the lower reaches of Fujiang River, with the changing hydrological conditions in recent years, the fish composition in Tongnan Section of Fujiang River has dramatic changes. It has been found during investigations in the past years that benthic fishes and fishes adapted to rapids are gradually reduced, while *cyprinus carpio*, *carassius auratus*, catfish, *ctenopharyngodon idella* and such other fishes adapted to still and open water are increasing in number.

① Fish groups by habitat

Benthic fishes: include 26 kinds such as *balitoridae*, *sisoridae*, *amblycipitidae*, *barbinae*, *gobioninae*, *siluridae*, *sinilabeo rendahli rendahli*, *cyprininae*, *bagridae*, and *cobitidae*, accounting for 51.0% of the total number of fish kinds in the area.

Pelagic fishes: include 19 kinds such as *danioninae*, *rhodeinae*, *sinibrama wui* and *ctenopharyngodon idella* that with compressiform live in middle and upper layers of deep pools and tributaries, accounting for 37.2% of the total number of fish

kinds in the area.

Fishes living in still water with grass at river side: include 6 kinds, i.e., snakehead, *pseudorasbora parva*, medaka, *hypseleotris swinhonis*, *ctenogobiusgiurinus* and *monopterus*, which are mainly small fishes with nesting habit, accounting 11.7% of the total number of fish kinds in the area.

② Fish groups by feeding habit

There are four groups: filter-feeding fish group, herbivorous fish group, carnivorous fish group, and omnivorous fish group.

Filter-feeding fish group includes only two kinds, i.e., *hypophthalmichthys molitrix* and *hypophthalmichthys nobilis*, accounting for 3.9% of the total number of fish kinds in the area.

Herbivorous fish group includes 13 kinds of fish such as *Sinilabeo rendahli*, *pseudogyrinocheilus prochilus*, *xenocypris davidi*, *sinogastromyzon*, *ctenopharyngodon idella*, *squaliobarbus curriculus*, and *spinibarbus sinensis* that feed on high grade vascular plants and periphyton, accounting for 25.5% of the total number of fish kinds in the area.

Carnivorous fish group includes 26 kinds of fish such as *siniperca chuatsi*, catfish, *leiocassis*, *mystus macropterus*, snakehead, *hypseleotris swinhonis*, *monopterus*, *pelteobagrus*, *ctenogobiusgiurinus*, *sisoridae*, bleak fish, and *opsariichthys bidens*, which are large ferocious fishes and medium- and small-size fishes feeding on benthic molluscs and aquatic larvae, accounting for 50.9% of the total number of fish kinds in the area.

Omnivorous fish group includes 10 kinds of fish such as *cyprinus carpio*, *carassius auratus*, *misgurnus anguillicaudatus*, *pseudogyrinocheilus prochilus*, *procypris rabaudi*, and *abbottina*, accounting for 19.6% of the total number of fish kinds in the evaluated area.

③ Fish groups by breeding type

There are four known breeding types of fish in this section of Fujiang River:

Fish group with drifting eggs: includes 9 kinds of fish such as *ctenopharyngodon idella*, *hypophthalmichthys molitrix*, *hypophthalmichthys nobilis*, *cobitis taenia*, *opsariichthys bidens*, *hemibarbus maculatus*, and *sinogastromyzon*, accounting for 17.6% of the total number of breeding kinds in the area.

Fish group laying adhesive eggs: includes 29 kinds of fish such as *cyprininae*, *danioninae*, *xenocypris*, *misgurnus anguillicaudatus*, *pseudorasbora parva*, *hemiculter leucisculus*, and *siluriformes* that lay adhesive eggs in still water and

highly adhesive eggs in rapids, accounting for 56.9% of the total number of breeding kinds in the evaluated area.

Fish group with pelagic eggs: includes 8 kinds of fish such as hemiculter bleekeri, hemiculter nigromarginis, snakehead, monopterus, siniperca chuatsi, hypseleotris swinhonis and ctenogobiusgiurinus, accounting for 15.7% of the total number of breeding kinds in the area.

Symbiotic or other fish groups: include 5 kinds of fish such as paradise fish and sarcocheilichthys spawning eggs in mantle cavity of mollusks, and ovoviviparous medaka, accounting for 9.9% of the total number of breeding kinds in the area.

The spawning behavior of fish in Tongnan Section of Fujiang River is closely associated with the environment state of water system in this river section. The fishes with adhesive eggs and adapted to spawning in rapids and having special requirements of spawning environment and fishes spawning in still water account for 56.9% of the total number of fish kinds in this river section. Ctenopharyngodon idella, hypophthalmichthys molitrix, hypophthalmichthys nobilis and other fishes spawn drifting eggs that needs a long drifting distance to complete embryonic development, but the environmental condition for eggs to drift a long distance does not exist in the section of Fujiang River.

4) Current status of key protection species

① Rare protection fish

According to the resource investigation conducted in 1970s (the *Jialing River Fishery Resources Investigation Report*) at the Fujiang River section, the nationwide rare protection fish such as acipenser dabryanus and mullet etc. had been found. There are no places for reproduction of this fish on Fujiang River, and this fish is temporary living fish flowing from the main stream of Yangtze River for food. Upon the construction of hydropower projects on Jialing River and Fujiang River, the migration channels for this fish have been cut off. This fish had not been found during several investigations since 2004 and there are no miss-catching records of rare fish.

② Endemic fishes in upper reach of Yangtze River

According to results of investigation conducted in 2004, there are 12 endemic species of fish in upper reaches of Yangtze River distributed at the Tongnan section of Fujiang River in total. Most of these species had moved out of this section by 2007 due to backwater arising from the Fujinba navigation and hydropower complex, and only procypris rabaudi was found.

The above-mentioned fish had not been found by the preparation unit in the resource investigation conducted at the Tongnan section of Fujiang River in 2009-2010. Based on the visit and investigation of fishermen, still there was some

fish in this species caught by fishermen, but in a very low number.

According to the above-mentioned analysis, the impoundment of reservoir of Fujinba navigation and - hydropower complex in the lower reaches has reduced the flow velocity off Fujiang River reaches in downtown Tongnan; therefore, some endemic fish in upper reaches of Yangtze River subject to benthic living of torrent has moved out of the water basin due to change of hydrological conditions and division by hydraulic structures. Currently, there are still a few species left, but belonging to individuals left, so their resource prospect is not promising.

③ Endemic key protection fish and introductions thereof

Currently, *procypris rabaudi* has been found in the endemic key protection area at this river section.

Taxonomic status: *Procypris rabaudi*, belonging to cypriniformes, cyprinidae, cyprininae and *procypris*, commonly known as Rock carp.

Morphological characteristics: flat and rhombic sides, back bulged to arc shape, and round abdomen; small and conical head, relatively sharp lip shorter than length between two eyes ends; sub-hypognathous part in U shape; thick lip with unobvious papillary bulges, no papillary bulges for small ones; 2 couples of barbel, the rear couple a bit longer than the front couple, eye diameters approximately in the same length; big eyes; flat and straight lateral line, with 43-45 scales; particularly strong dorsal and anal fin, with saw tooth on rear edge; flat and straight outer edge of dorsal fin, long substrate with 18-21 branch fin rays; beginning points of dorsal and pelvic fin opposite to each other; long pectoral fin, with end reaching the beginning point of pelvic fin; dark black or dark purple head and body back, with a little blue purple gloss, and silvery white abdomen; 1 black spot behind each scale; 1 black edge behind the tail fin; during reproductive period, each scale of milt in dark black, with spot at the head.

Living habits: most of *procypris rabaudi* lives at bottom of water body with relatively gentle water flow and many rocks at substrate, and often appears among rocks. The *procypris rabaudi* overwinters in grotto or deep bay in riverbed, and starts swimming up to any tributary for spawning at beginning of spring. The minimum maturation age is 4 years old. The spawning period is February ~ April, preferably February ~ March. Based on the information provided by fishermen, there are also brood stocks activities for spawning in autumn (August ~ September). Generally the spawning ground is distributed in the water basin with tributary rapids and substrate of gravel. Spawn appears faint yellow and attaches on rocks to grow. *Procypris rabaudi* is subject to a relatively slow growth. Generally, the 4-year-old fish can reach about 0.5 kg in weight; the 10-year-old fish can reach 59 cm in length and 4 kg in weight; and the common individuals are 0.2-1.0 kg in weight, and the individual can reach 10.0 kg in weight at most according to records. Although *procypris rabaudi* belongs to omnivorous fish, but it prefers the benthonic animals, dominated by mollusks such as chironomid larvae, ephemeroptera and trichoptera larvae,

oligochaeta, small periwinkle, corbiculidae and limnoperna lacustris etc., and supplemented by decaying higher plant debris and occasionally by a little phytoplankton and zooplankton. *Procypris rabaudi* has no ingestion in winter. The ingestion increases in March ~ April to peak in July ~ August.

Resources characteristics: *procypris rabaudi* is distributed in main stream and tributary in upper reaches of Yangtze River. In recent years, dam gate has been built on the tributary in upper reaches of Yangtze River, which cuts off the migration channel to spawning ground for *procypris rabaudi*. Besides, the *procypris rabaudi* resources have been damaged very seriously due to high-intensity fishing, in particular the large-scale electric fishing, and impacted by threatening factors such as degradation of water quality caused by sewage discharge of factories along the river etc., so this fish is subject to a relatively low growth, the population cannot be replenished in time and the wild populations are dwindling year by year.

5) "Three Grounds" for fish

① Spawning grounds

As per the *List of Fish Spawning Grounds Distribution in Natural Water System in Tongnan County* (Tongnan Agriculture Bureau 2009-3-28), Tongnan Section of Fujiang River of about 40 km long has 20 spawning grounds, among which 2 spawning grounds is related to Dafuba Embankment Works. Refer to Table 4-8 and Table 4-9 for details about their names and distributions.

Table 4-8 Information about Huangjiaotang Spawning Ground

Spawning Ground	Contents	Remarks
Location	Huangjiaotang (200m upstream of the reaches where the embankment section I starts)	
Protection level and importance (general, special significance, critical, endangered, etc.)	Spawning fishes include <i>cyprinus carpio</i> , <i>carassius auratus</i> , <i>siluridae</i> (catfish) and others. This is a general fish spawning ground.	Local
Scope of protection (attached figure)	Jinlong Temple - Hongyanzui Lift Irrigation Station	See the attached figure
Time	March - May	
Competent authority	Tongnan Agriculture Committee	

Table 4-9 Information about Xibutang Spawning Ground

Spawning Ground	Contents	Remarks
Location	About 400 m to the east of the embankment section II	
Protection level and importance (general, special significance, critical, endangered, etc.)	Spawning fishes include <i>cyprinus carpio</i> , <i>carassius auratus</i> , <i>siluridae</i> (catfish) and others. This	Local

	is a general fish spawning ground.	
Scope of protection (attached figure)	Xibu Village upstream from the urban area consisting of Liaojiazhou sandbank, and the area within 200 m upstream and downstream from Xibutang	See the attached figure
Time	March - May	
Competent authority	Tongnan Agriculture Committee	

(I) Xibutang Spawning Ground

This spawning ground is located in Xibu Village upstream from the urban area, with an area of about 60 hectares. In dry season, due to diversion by Sankuaishi Hydropower Station, most water from upstream area is diverted via an aqueduct (artificial canal) into the hydropower station at the left of the river channel. Sankuaishi and Liaojiazhou on the right side of the river channel stand exposed from water. Liaojiazhou sandbank is covered with sparse herbaceous plants. As upstream water increases in flood season, most of the sandbank is submerged, forming a good spawning ground for fish laying viscid eggs. It is an important supplementary spawning ground for fishes (cyprinus carpio and carassius auratus) laying weakly adhesive eggs in the lower reaches of Fujiang River. Estimated based on the area of the spawning ground, the annual number of eggs spawned is about 10 million.

(II) Huangjiaotang (Jinlong Temple - Hongyanzui Lift Irrigation Station) Spawning Ground

This spawning ground is located in Xinsheng Village upstream from the urban area. Similar to Xibutang Spawning Ground, in dry season, due to diversion by Sankuaishi Hydropower Station, most water from upstream area is diverted via Hanjiang artificial canal into the hydropower station at the left of the river channel. Jinlong Temple - Hongyanzui Lift Irrigation Station stands from water. As upstream water increases in flood season, most of the sandbank is submerged, forming a good spawning ground for fish laying viscid eggs such as cyprinus carpio, carassius auratus and catfish. Estimated based on the area of the spawning ground, the annual number of eggs spawned is about 12 million.

(2) Fujiang River National Wetland Park

As one of the fourth national wetland parks approved by the state, Fujiang River National Wetland Park is divided into the conservation zone, the restoration and reconstruction zone, the service management zone, the propaganda, education and demonstration zone and the rational utilization zone. The part involved in the Project is located in the rational utilization zone of the wetland park. The rational utilization zone is an area for hydrophilic activities and recreational activities like sightseeing, exploration, rural (fishing and herding) tourism depending on the natural geographical conditions, natural resources and landscapes of the wetland park.

Fujiang River National Wetland Park lies in Fujiang River Basin in Tongnan County, Chongqing Municipality, starting from Jinfo Bridge in the west and ending at Biekou Township in the east and the southern and northern boundaries being the perennial water lines of Fujiang River extending outside for 100 m. The southern and northern sides of the section from Fujiang Bridge to Jinfo Bridge take the embankment roads as the boundaries. All flood lands, green vegetable plantations and the scenic spot of Giant Buddha Temple at sides of the river channel are in the scope of planning. The total area planned is 1,450 hm², including 554.1 hm² of wetland which is under construction.

The total wetland area within the wetland park is about 554.1 hectares. The natural wetland includes riverine wetlands and scattered tidal flat wetlands, while the artificial wetland mainly consists of some small-sized fishponds and paddy fields. The area of riverine wetlands is 455.6 hectares, accounting for 82.2% of the total wetland area, and the area of tidal flat wetlands is about 97.3 hectares, accounting for 17.6% of the total wetland area, mainly distributed at river channel turns, flat and gentle locations of the Fujiang River. The area of artificial wetland is about 1.2 hectares, accounting for 0.2% of the total wetland area, mainly distributed along the river reaches of Fujiang River adjacent to Shanghe Town.

Based on the planning concept of laying equal stress on protection and restoration, combining treatment and utilization, giving consideration to both ecology and landscape and maintaining harmony between nature and society, Fujiang River National Wetland Park is exactly defined as:

① A demonstration area for protection and restoration of national riverine wetland

Function: to build a demonstration base for construction of national wetland park.

② A popular science propaganda and education base for wetland in Chongqing Municipality

Function: as an important element in urban forest construction of Chongqing Municipality, to show the ecological functions of wetland, propagandize the significance of wetland protection, and improve people's environmental consciousness of wetland protection.

③ A growth point in ecological tourism of Tongnan County

Function: to build the riverside areas of Fujiang River into an Eco-Eden to achieve self-cultivation and harmony between human and nature.

④ An urban green ecology card of Tongnan County

Function: to carry forward Buddhism, Red Revolution, green vegetable and special food cultures of China.

⑤ A hydrological and water quality monitoring station for Jialing River

Function: to serve as the exchange and cooperation platform integrated with scientific research, monitoring and propaganda and education of wetland.

4.2.2 Soil Conditions and Water Loss and Soil Erosion

As one of the places with relative shortage in land resources, Chongqing is featured with various complicated geomorphic types, serious water loss and soil erosion, and diversified land types. Chongqing Municipal People's Government has divided the key prevention and treatment area of water loss and soil erosion under its administration into the key prevention and protection zone, the key supervision zone and the key treatment zone.

Refer to Table 4-10 for meteorological conditions at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-10 Overview of Soil Conditions at Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

Category	Component			
	Laixi River Integrated improvement Works in Rongchang County	Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County
Soil	At the construction site, the soil mainly consists of purple soil, alluvial soil and paddy soil, with some artificial miscellaneous fill.	At the construction site, the soil consists of purple soil, alluvial soil and paddy soil.	At the construction site, the soil is banded and scattered alluvial soil.	At the construction site, the soil is Southern China red soil.
Water Loss and Soil Erosion	The construction site is a key treatment zone, mainly with slight, mild and moderate degrees of water loss and soil erosion and the average soil erosion modulus being 2,785 t/(km ² •a).	The construction site is a key supervision and treatment zone, mainly with mild and moderate degrees of water loss and soil erosion and the average soil erosion modulus being 3,165 t/(km ² •a).	The construction site is a key prevention and protection zone, mainly with moderate degree of water loss and soil erosion and the average soil erosion modulus being 3,500 t/(km ² •a).	The construction site is a key treatment zone, mainly with slight, mild and moderate degrees of water loss and soil erosion and the average soil erosion modulus being 2,600 t/(km ² •a).

4.3 Current Social and Economic Status

4.3.1 Society

Located along the upper reaches of the Yangtze River, Chongqing Municipality has 38 districts and counties (autonomous counties) under its administration, including 839 townships and 175 subdistricts. Within the scope of this municipality, 33 of these 38 districts and counties are assigned with the tasks of poverty alleviation through development, and there are 18 key counties contained in the plan for poverty alleviation through development, including 14 national-level key counties and 4 municipal-level key counties for purpose of this plan. According to the sixth nationwide population census in 2010, the total population of Chongqing is 28,846,200, including 13,550,700 urban population. In 2011, its population with urban employment was 7,907,000 and the urban registered population without employment was 129,600. In 2011, the urban per capita disposable income of Chongqing Municipality was RMB 20,250, with RMB 1,560 less than national urban per capita disposable income (RMB 21,810) and ranking No. 11 nationwide, and the rural per capita net income was RMB 6,480, with RMB 497 less than national rural per capita net income (RMB 6,977) and ranking No. 18 nationwide.

Rongchang Laixi River Sewage collection and treatment Works, Shizhu Longhe River Sewage collection and treatment Works, Pengshui Wujiang River Sewage collection and treatment Works and Tongnan Fujiang River Flood Control Works are respectively located in Rongchang County, Shizhu Tujia Autonomous County, Pengshui Miao-Tujia Autonomous County and Tongnan County of Chongqing Municipality. Refer to Table 4-11 for overview of social situations at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-11 Overview of Social Situations at Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

	Item	Overview of Social Situations
Components	Laixi River Integrated Improvement Works in Rongchang County	Rongchang County covers an area of 1,079 km ² in total and administers 15 towns, 6 subdistricts, 209 administrative villages and 41 communities. According to the sixth nationwide population census in 2010, this county has the permanent resident population of 669,700 and urban population of 322,800, including 9,500 urban poverty population and 14,000 rural poverty population. In 2011, the newly-added population of rural labor transferred was 8,923, the newly-added urban population with employment was 10,585, and the urban registered population without employment was 3,443 in the county. In 2011, the urban per capita disposable income was RMB 19,295 and rural per capita disposable income was RMB 8,356 in the county. At the construction site, Lukong Town administers 1 town community, 3 villagers committees and 24 groups of villagers, and has a total population of 15,900, including 5,100 urban population; Changzhou Subdistrict Office administers 6 communities (including 1 urban community and 5 rural communities), 4 villagers committees and 41 groups of villagers, and has a total population of 74,200, including 52,400 urban population.
	Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County	Shizhu Tujia Autonomous County covers an area of 3012.51 km ² in total and administers 32 towns, 214 administrative villages and 27 communities. According to the sixth nationwide population census in 2010, this county has the permanent resident population of 411,400 and urban population of 139,700, including 11,400 urban poverty population and 75,000 rural poverty population. In 2011, the urban registered population without employment was 1,892 in the county. In 2011, the urban per capita disposable income was RMB 16,555 and rural per capita disposable income was RMB 5,981 in the county. At the construction site, Nanbin Town administers 11 administrative villages, 12 community residents committees and 82 groups, and has a total population of 100,000, including 43,300 urban population.
	Flood control Revetment and Integrated Improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Pengshui Miao-Tujia Autonomous County covers an area of 3,903 km ² in total and administers 14 towns, 3 subdistricts, 22 townships, 26 neighborhood committees and 274 villagers committees. According to the sixth nationwide population census in 2010, this county has the permanent resident population of 540,600 and urban population of 137,400, including 11,500 urban poverty population and 94,000 rural poverty population. In 2011, the newly-added urban population with employment was 3,715 and the urban registered population without employment was 1,594 in the county. In 2011, the urban per capita disposable income was RMB 15,269 and rural per capita disposable income was RMB 5,215 in the county. At the construction site, Shaoqing Subdistrict Office administers 4 administrative villages and 6 community residents committees, and has a total population of 40,900, including 8,700 urban population.
	Water Environment Protection and Flood control Revetment Integrated Improvement	Tongnan County covers an area of 1,594 km ² in total and administers 20 townships, 2 subdistricts, 283 administrative villages and 19 neighborhood committees. According to the sixth nationwide population census in

Item	Overview of Social Situations
Works for Dafuba Reaches of Fujiang River in Tongnan County	2010, this county has the permanent resident population of 640,000 and urban population of 233,300, including 11,600 urban poverty population and 37,000 rural poverty population. In 2011, the urban registered population without employment was 2,204 in the county. In 2011, the urban per capita disposable income was RMB 17,910 and rural per capita disposable income was RMB 7,285 in the county. At the construction site, Zitong Subdistrict Office administers 20 administrative villages and 7 community residents committees, and has a total population of 129,500, including 70,000 urban population.

4.3.2 Industrial Economy

In 2012, the regional gross domestic product of Chongqing Municipality was RMB 1001.113 billion, increasing by 16.4% over the previous year. To be specific, the added value of primary industry was RMB 84.452 billion, increased by 5.1%; the added value of secondary industry was RMB 554.280 billion, increased by 21.8%; and the added value of tertiary industry was RMB 362.381 billion, increased by 10.8%. Calculated based on the permanent resident population, the annual per capita regional gross domestic product reached RMB 34,500, increasing by 15.2% over the previous year.

Refer to Table 4-12 for industrial economy conditions at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-12 Industrial Economy Conditions at the Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

Item		Industrial Economy
Components	Laixi River Integrated improvement Works in Rongchang County	The pillar industry of Rongchang County is animal husbandry. In 2011, the regional gross domestic product of Rongchang County was RMB 20.755 billion. To be specific, the added value of primary industry was RMB 3.220 billion, increased by 15.5%; the added value of secondary industry was RMB 12.372 billion, increased by 59.6%; and the added value of tertiary industry was RMB 5.163 billion, increased by 24.9%. Calculated based on the permanent resident population, the annual per capita regional gross domestic product reached RMB 31,253.
	Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	The pillar industries of Shizhu County are agriculture and tourism. In 2011, the regional gross domestic product of Shizhu County was RMB 8.015 billion. To be specific, the added value of primary industry was RMB 1.643 billion, increased by 20.5%; the added value of secondary industry was RMB 3.455 billion, increased by 43.1%; and the added value of tertiary industry was RMB 2.917 billion, increased by 36.4%. The annual production value of fishery was RMB 0.011 billion for the whole county. Calculated based on the permanent resident population, the annual per capita regional gross domestic product reached RMB 19,396.
	Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	The pillar industries of Pengshui County are agriculture and tourism. In 2011, the regional gross domestic product of Pengshui County was RMB 7.649 billion. To be specific, the added value of primary industry was RMB 1.604 billion, increased by 21%; the added value of secondary industry was RMB 3.068 billion, increased by 40.1%; and the added value of tertiary industry was RMB 2.979 billion, increased by 38.9%. Calculated based on the permanent resident population, the annual per capita regional gross domestic product reached RMB 14,091.
	Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County	The pillar industry of Tongnan County is agriculture. In 2011, the regional gross domestic product of Tongnan County was RMB 14.693 billion. To be specific, the added value of primary industry was RMB 3.352 billion, increased by 22.8%; the added value of secondary industry was RMB 6.088 billion, increased by 41.4%; and the added value of tertiary industry was RMB 5.253 billion, increased by 35.8%. Calculated based on the permanent resident population, the annual per capita regional gross domestic product reached RMB 22,875.

4.3.3 Transportation

Chongqing is the only metropolis integrated with water, land and air transportation resources in the upper reaches of the Yangtze River in China, also a comprehensive transportation junction in Southwest China.

Refer to Table 4-13 for overview of transportation system at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-13 Overview of Access at the Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

	Item	Transportation Access
Component s	Laixi River Integrated improvement Works in Rongchang County	Site access: mainly by road; and the main transportation line is Chongqing → Rongchang county town (Chongqing-Kunming Expressway, 120 km) → Laixi River (Provincial Road No. 310, 10 km). In-site access: mainly by existing roads; and a new 2.5 km long in-site road will be constructed, applied with clay bound macadam pavement, with the pavement width of 3.5 m and the road grade of Grade IV in-site access.
	Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	Site access: As the Works is located in Shizhu County town, where many urban trunk roads passes through, it is unnecessary to construct a new site access. In-site access: A new 1.96 km long in-site access will be constructed for the Works, applied with clay bound macadam pavement and the pavement width of 3.5 m.
	Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Site access: The site access for the Works is quite convenient because the land and water accesses are well developed and National Highway No. 319, Chongqing-Hunan Expressway, Chongqing-Huaihua Railway passes through the county in central county town. In-site access: Most of in-site access and transportation are done by existing roads which connecting all sites of the Works. In addition, a few of existing cement roads need to be renovated, and reinforcement or dismantling and reconstruction will be implemented to a 5 m wide simple bridge among existing accesses.
	Water Environment Protection and Flood control Revetment	Site access: For the Works, there is Chengdu-Chongqing Loop Line Expressway

Item	Transportation Access
Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County	<p>G93 for external access, S205, Dafu Road and tractor road directly leading to the site of Works, and the roads along riverbanks to connect the sand borrow area and the livestock farm.</p> <p>In-site access: The top of embankment may be used as a temporary road, with the road length of 1.8 km. Other new temporary roads before and after the embankment will be constructed, with the road length of 5.42 km and pavement width of 5.0 m, both applied with clay bound macadam pavement. In addition, a rural road will be expanded for 700 m long, with the pavement width expanded for 2 m wider than the original pavement width which is 3 m, applied with clay bound macadam pavement. After construction completion, the rural road will be kept as a permanent road leading up to the embankment.</p>

4.3.4 Tourism and Historical and Cultural Sites

(1) Tourism

Chongqing is rich in tourism resources, varying from magnificent natural landscapes including mountains, waters, forests, springs, waterfalls, valleys and caves to strong cultural landscapes integrating Bayu culture, ethnic culture, migration culture, Three Gorges culture, provisional capital culture and urban culture.

Refer to Table 4-14 for overview of tourism resources at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan.

Table 4-14 Overview of Tourism Resources at Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan

Category	Component			
	Laixi River Integrated improvement Works in Rongchang County	Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County
Tourism	<p>There are numerous natural and cultural landscapes in Rongchang County, such as Lukong Ancient Town, Lanfeng Forest Park, Arhat Temple Archway in Qingshen Town, Shiantang Stone Cave Temple in Yuanjue Town, and Changzhou Relics in Panlong Town.</p>	<p>The tourism of Shizhu County is characterized by green ecology, historic culture and Tujia folk customs. The tourism resources of the county include Xituo Ancient Town – one of the first ten famous historical and cultural towns approved by the state, Wild Grass Field – a showplace of karst landform Primitive Forest, Huangshui National Forest Park, and Rock Coffin Clusters along Longhe River.</p>	<p>The tourism of Pengshui County is highlighted with features of "natural ecology, ethnic customs and historic culture", centered on the topics of "mountain, water, folk customs, history and festival" and refined with the characteristic scenic spots like Wujiang River Art Gallery, Ayi River, Mowei Mountain, Yushan Ancient Town and Anzi Miao Stockade Village.</p>	<p>There are numerous natural and cultural landscapes in Tongnan County, such as Shuangjiang Town – one of the first ten famous historical towns approved by the state, Gold-ornamented and Cliff-carved Giant Buddha – the seventh largest Buddha in the world, Malong Mountain Reclining Buddha – the largest reclining Buddha in the state, "Stone Steps with Tweedle" – one of the four echo architectures in the state, Residential Building Clusters of Qing Dynasty – the best-protected residential building clusters in Southwest China, and Yang Angong's Former Residence and Cemetery – a national patriotism education and demonstration base.</p>

(2) Cultural relics

There are 55 key historical and cultural sites under state protection and 341 historical and cultural sites under provincial protection in Chongqing. The cultural relics at the site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan are described below:

① Laixi River Integrated improvement Works in Rongchang County

Wanling Ancient Town (originally named Lukong Ancient Town) is a cultural relic protection site in Rongchang county. It is located to the east of Rongchang County, with the ancient town streets 13 km away from the county town. The major symbolic cultural relics of the ancient town are Darong Bridge, Huguang Guild Hall and Zhao's Ancestor Temple. Wanling Ancient Town lies on the left bank of Laixi River. The construction of embankment at this side has been completed, so no more construction is required for the project. Designed as a stone arch bridge, Darong Bridge (a historical and cultural site under municipal protection) crosses Laixi River. No construction will be done on left bank of this bridge, but the right bank is in the scope of works. Therefore, only two cultural relics are involved in Laixi River Integrated improvement Works in Rongchang County.

(I) Wanling Ancient Town: According to *Overall Planning for Lukong Town in Rongchang County (2010-2030)*, the control scope of Wanling Ancient Town is 80~100 m on both banks of Laixi River. Refer to the attached drawing for the protection scope of Wanling Ancient Town.

Wanling Ancient Town has a long history. In Song and Ming Dynasties, some shops for rest, accommodation and storing cargoes of itinerant traders formed in Lukong and they are called "wharfs". In Qing Dynasty, Lukong was under the administration of Fenggaoli, and some markets took shape in Lukong and were called Lukong Market. In the fifth year of the reign of Qing Emperor Jiaqing, some local gentry built Darong Stockade on mountains in order to prevent the widespread the White Lotus Society Uprising in east Sichuan.

In its long history of development, multiple cultures have formed in Wanling Ancient Town, including stockade fortress culture, trading port culture, migration culture, folk customs and culture, and landscape culture. Most of the streets and lanes in the ancient town were paved with stone slabs, meandering along the river channel and fluctuating along with the topography. The total length of main streets is 324 m. The traditional architectures of the ancient town were built based on the mountain topography, with platforms built in steps and footings made for sharp slopes, naturally forming the overall style and features of seemingly multi-storey and overlapping buildings and having highly historical, architectural and aesthetic values.

(II) Darong Bridge: According to the *Reply Letter on the Protection Scope of Cultural Relics Involved by Laixi River Integrated improvement Works* issued by Rongchang Administration of Culture, Radio, Television, Press and Publication, the protection scope of Darong Bridge include 2 m of banks at both bridge ends and 15 m in both upper and lower reaches from the bridge. Refer to the attached drawing for the protection scope of Darong Bridge.

Darong Bridge was built in the first year under the reign of Ming Emperor Zhengde. It is a stone slab bridge, with the bridge deck paved by flat and even stones, each of which is about 10 t in weight. The bridge is 116 m in total length and 1.75 m in width, and its 24 spans connect the east and west banks of Lukong Town. Darong Bridge has been designed with a Π shape which is for convenient passage by boats and ships. With semi-circle stone orifices provided at both sides of the Π shape for foil purpose. Therefore, the bridge has highly historical, architectural and aesthetic values.

② Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County

No cultural relics and tombs are involved in the component.

③ Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

Located in Jiangnan Village Group III, Hanjia Town, Pengshui County, Chongqing Municipality, Xujiaba Site has been published as one of the second historical and cultural sites under government protection of Chongqing in January 2010. This component will occupy the archaeological excavation area and general protection area of Xujiaba Site. Therefore, one cultural relic and 4 common family tombs are involved in Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County.

Xujiaba Site: According to the outcome of archaeological works of Xujiaba Site and based on the construction land planning of this component, the protection area of Xujiaba Site has been divided into original location protection area, archaeological excavation area and general protection area. Refer to attached drawing for the protection scope of Xujiaba Site.

According to the *Notice on Publishing the Second Historical and Cultural Sites under Government Protection of Chongqing Issued by Chongqing Municipal People's Government* (YFF [2009] No. 118), Xujiaba Site is a settlement site of the ancient sites of Shang and Zhou Dynasties. The site is in the scope Linjiang Group 9 (originally Tianchi Village Group 3), facing east and covering an area about 45,000 m². It is located on a Grade II terrace on left bank of Wujiang River, closely neighboring the

river.

The excavated potteries from Xujiaba Site consists of many round-bottomed vessels and a few circular-leg vessels, flat-bottomed vessels and V-bottom vessels. Besides, a number of potteries with dish-shaped mouth, pottery barns, porcelain pots, saucers, bowls, etc. have been excavated from the cultural layers of Han and Tang Dynasties. The value of cultural relics from Xujiaba Site has been evaluated as "high" by Chongqing Academy of Cultural Heritage, showing highly archaeological significance.

④ Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

According to the *Comments on the Feasibility Study Report of Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches in Tongnan County by Chongqing Municipal Administration of Cultural Heritage* (YWW [2013] No. 274), this component is in the scope of environment coordination area of bas-reliefs on precipices of the Giant Buddha Temple in Tongnan County, which is a key historical and cultural sites under state protection. Therefore, one cultural relic and 32 common family tombs are involved in Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County.

According to the *Detailed Plan for Construction of the Giant Buddha Temple Cultural Tourist Attraction in Tongnan County*, the cultural relic protection area of the Giant Buddha Temple has been divided into three parts, i.e. the core zone under cultural relic protection, the control zone, and the environment and landscape coordination zone. The core zone under cultural relic protection covers an area of 0.2 km². In principle, the architectures within this zone should be mainly subject to protection, restoring the old as the old and no addition of new functions. The control zone covers an area of 0.848 km² approximately. The height of architectures within this zone should be controlled less than 18 m. From the core zone to the control zone, a stepped transition control area should be formed, with the height controlled in 11 m ~ 18 m and the style being Bayu pseudo-classic architecture. Refer to attached drawing for the protection scope of the Giant Buddha Temple.

Situated at the foot of Dingming Mountain, 1.5 km away from Tongnan County, Chongqing Municipality, the Giant Buddha Temple is a famous tourist attraction in the municipal-level scenic spot in Tongnan County, i.e. the Dingming Mountain - Canal Scenic Spot. In the scope of this scenic spot, the Gold-ornamented and Cliff-carved Giant Buddha is as high as 27 m, being the largest gold-ornamented Buddha in China and ranking No. 8 in the world. In August 1956, the Gold-ornamented and Cliff-carved Giant Buddha was approved as one of the first historical and cultural sites under provincial key protection by People's Government

of Sichuan Province. Classified as cultural relics of Sui to Qing Dynasties, the bas-reliefs on precipices of the Giant Buddha Temple in Tongnan County were approved by the State Council of the People's Republic of China to be included in the list of the six key historical and cultural sites under state protection on May 25, 2006.

The existing four wooden-structure ancient architectures of the Giant Buddha Temple are the Great Buddha Hall, the Hall of Avalokitesvara Buddhisatva, the Hall of the Supreme Deity in Taoism and the Mirror Pavilion, mainly being relics of the late Qing Dynasty. With the height of 33 m, the Great Buddha Hall is magnificent, built near the mountain and by the river, featured by high attics and overhanging eaves, and unique in structure. The cultural relics kept in the Giant Buddha Temple include more than 700 divine statues of Confucianism, Buddhism and Taoism in 104 shrines from Sui and Tang Dynasties to present, 83 pieces of inscriptions, poems, stone tablets and statues of poets, literary men and senior officers of the court in the past dynasties, 20 pieces of gold-plating pillar couplet engravings, and 5 pieces of hydrological inscriptions. The scenic spot is not only distributed with big and tall gold-ornamented divine statues, but also featured by picturesque rocks, variable rainfalls and clouds, beautiful mountains and clear waters, and pleasant landscapes. The most famous tourist attractions include the Hall of the Supreme Deity in Taoism, the Hall of Avalokitesvara Buddhisatva, the Great Buddha Hall, the Stone Steps with Tweedle, the Mirror Pavilion, the Divine Chinese Character "佛" (Buddha), the Statute of Guan Yu, the Misery-saving Deity in Taoism, the Autumn Moon Scene Formed by Natural Green Screen, and the Echo Rock Giving the Sound of Sea Tide, all of which having highly historical, religious and aesthetic values.

4.4 Current Situation of Sewage Management in Project Area

(1) Laixi River Integrated Improvement Works in Rongchang County

For Lukong District (Lukong Town, Erlangtan and Shabu), the current sewage production is 3,500 m³/d and the sewage collection ratio is 30%. The drainage system of this district is a combined rain-sewage discharge system. The sewage water enters Rongchang Urban Sewage collection and treatment Plant via sewage discharging and intercepting mains of Chishui River and Class I sewage intercepting pipelines of Laixi River, while the surplus rain water flows into Laixi River via the overflow outlets set at the river mouth. Rongchang Urban Sewage collection and treatment Plant has been put in formal operation in March 2009, with the design treatment capacity of 25,000 m³/d, the actual treatment capacity of 15,000 m³/d and the sewage collection and treatment ratio of 60%.

(2) Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County

For central urban area of Shizhu County, the current sewage production is

23,800 m³/d and the sewage collection ratio is 60%. A rain-sewage diversion system has been applied to this area. The sewage enters Shizhu Sewage collection and treatment Plant via the sewage pipe network, while the rain water flows into Longhe River via the rain water pipe network. At present, Shizhu Sewage collection and treatment Plant has been put in operation, with the design treatment capacity of 20,000 m³/d, the actual treatment capacity of 17,000 m³/d and the sewage collection and treatment ratio of 85%.

(3) Flood control Revetment and Integrated Improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

For Shangtang District, Xiatang District and Xujiaba residential area, the current sewage production is about 1,000 m³/d. Since no sewage collection and treatment plant has been constructed in this area, the sewage pipe network is not connected and the domestic sewage from Shangtang District, Xiatang District and Xujiaba residential area is directly discharged into Wujiang River.

(4) Water Environment Protection and Flood control Revetment Integrated Improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

Since Dafuba district is still a rural area at present, the sewage pipe network is not connected and the sewage is directly discharged into Fujiang River.

4.5 Current Situation of Flood Control Facilities in Project Area

(1) Laixi River Integrated Improvement Works in Rongchang County

The part upstream of the job river reaches is Yutan Reservoir Dam without embankment. The part downstream of the job river reaches is Gaoqiao embankment, which is located in Community 3 of Gaoqiao Village, Guangshun subdistrict and designed in accordance with the 20-year flood control standard.

(2) Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County

For central urban area of Shizhu County, the flood control standard of the embankment is 10-year flood.

(3) Flood control Revetment and Integrated Improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

Pengshui county town (about 4 km upstream of the flood control revetment works of this component) is built along Wujiang River and Yujiang River, and the bank line along the two rivers is more than 10 km in total length. Up to 2011, the length of

all embankments completed and under construction only reaches 2.82 km. In addition, the construction of the embankments completed is not perfect and fails to meet the flood control standards and requirements.

(4) Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

According to the "Reply to *Flood Control Planning Report for Tongnan County Town Reaches of Fujiang River*" (TNF [2012] No. 146) issued by Tongnan County People's Government on June 19, 2012, the comprehensive flood control standard for Tongnan county town has been determined as 50-year flood. Following the planning guideline of meeting the standards step by step in a zone-wise and stage-wise manner, the flood control standard of this component is planned and designed as per the 20-year flood in the near term. To be specific, the flood control standards for embankments of Dafuba District and Sankuaishi District has been planned as per 20-year flood; the flood control standard for the vegetable base river reaches, which are a rural river reaches, has been planned as per 10-year flood, and revetment scour prevention treatment could only be done to the river reaches in the near term.

Currently, the embankment works (Phase I and Phase II) completed in urban area of Tongnan County are located in the Ancient Town ~ Liangfengya District in urban area of Tongnan County, Chongqing, lying on right bank of Fujiang River. The embankment works starts from Wenxingdi in Tongnan county town and ends at Tanjiaqiao, with the total length of 2,434 m and the flood control standard designed as per 20-year flood.

4.6 Due Diligences for Relevant Works

4.6.1 Due Diligence for Sewage Treatment Plant

(1) Laixi River Integrated Improvement Works in Rongchang County

The sewage collected by this component will enter Rongchang Urban Sewage Treatment Plant and Lukong Sewage Treatment Plant via the sewage pipe networks, with the sewage collection and treatment ratio being 95.88% and 4.12% respectively.

① Rongchang Urban Sewage Collection and Treatment Plant

Rongchang Urban Sewage Treatment Plant passed the environment impact assessment (EIA) on December 23, 2002, obtained the EIA Approval (Y (S) HZ [2002] No. 245) issued by Chongqing Environment Protection Bureau, commenced in January 2005, started trial operation in July 2008, got the approval for commercial operation according to Y (S) HY [2009] No. 033 issued by Chongqing Environment

Protection Bureau in March 2009. The plant has been designed with the treatment capacity of 25,000 m³/d in Phase I and 25,000 m³/d in Phase II, with the total treatment capacity added up to 50,000 m³/d. Currently, its actual treatment capacity is 15,000 m³/d, with the surplus treatment capacity of 10,000 m³/d. The sewage collected by this component is 2,500 m³/d, 95% (2,375 m³/d) of which will enter Rongchang Urban Sewage collection and treatment Plant. Therefore, Rongchang Urban Sewage collection and treatment Plant could take in the sewage collected by this component.

Rongchang Urban Sewage Treatment Plant applies Carrousel biological treatment process, of which denitrification function is provided in front anaerobic cells, and uses anaerobic cells and oxidation ditches for dephosphorization and denitrification. The water discharged from the plant follows Standard B of Grade I in *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). The sludge of the sewage collection and treatment plant is dehydrated by belt dehydrator before being transported to Jiangjiagou Landfill for sanitary landfill disposal.

② Lukong Sewage Treatment Plant

Lukong Sewage Treatment Plant in Rongchang County was initiated by Rongchang Development and Reform Commission (RFGF [2010] No. 35), and it gained the Permission Notes for Location (XZDJ No. 500226201000019) issued by Rongchang Planning Administration on February 26, 2010. Currently, the plant has a treatment capacity of 350 m³/d, with a long-term (2020) treatment capacity of 800m³/d. The plant has been completed and it is subject to commissioning now. The sewage collected by this component is 2,500 m³/d, 5% of which (125 m³/d) will enter Lukong Sewage collection and treatment Plant. Therefore, Lukong Sewage collection and treatment Plant could take in the sewage collected by this component.

Lukong Sewage Treatment Plant in Rongchang County applies constructed rapid infiltration technology and the water discharged from the plant follows Standard B of Grade I in *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). The sludge of the sewage collection and treatment plant is naturally dehydrated in sludge drying bed before being transported to Jiangjiagou Landfill for sanitary landfill disposal.

(2) Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County

The sewage collected by this component will enter Shizhu Sewage collection and treatment Plant via the sewage pipe network.

The short-term works of Shizhu Sewage collection and treatment Plant finished

EIA, obtained the approval for completion acceptance and started to run formally. Its treatment capacity is 20,000 m³/d at present. After near-term expansion of the plant, its daily treatment capacity will be 40,000 m³/d. The near-term expansion will be done in two steps. For Step I, relevant works will be implemented in 2014 and expected to be completed in 2015, with the newly-added sewage collection and treatment capacity of 10,000 m³/d. For Step II, relevant works will be implemented in 2015 and expected to be completed in 2016, with the newly-added sewage collection and treatment capacity of 10,000 m³/d. The sewage collected by this component is 9,520 m³/d. When all expansion works of Shizhu Sewage collection and treatment Plant are completed, it could take in the sewage collected by this component.

Shizhu Sewage Treatment Plant applies SBR sequencing batch and activated sludge process treatment technology and the water discharged from the plant follows Standard B of Grade I in *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB18918-2002). The sludge of the sewage collection and treatment plant is dehydrated by belt dehydrator before being transported to the refuse landfill for sanitary landfill disposal.

(3) Flood control Revetment and Integrated Improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

Since the drainage plan for Pengshui component has not been completed at the present stage and the treatment capacity and location of Xujiaba Sewage collection and treatment Plant have not been determined yet, so no discussion is made for the plant in this section.

(4) Water Environment Protection and Flood control Revetment Integrated Improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

Since the sewage pipe network has not been connected for Dafuba District and the district is listed in the scope of 2010 ~ 2030 long-term planning zone of Tongnan urban area in the urban overall plan of Tongnan County, no development plan has been made for the near future. Based on the comments of the Owner and the Government of Tongnan County, no sewage collection and treatment works will be included in this component, so no discussion is made for such works in this section.

Table 4-15 Summary of Sewage Collection Arrangement in Areas Involved in the Project

	Works	Wastewater Treatment Plants	Scale (m ³ /d)	Wastewater Collected (m ³ /d)
t Activit	Laixi River Improvement Works of Rongchang County	Rongchang County Urban Wastewater Treatment Plant	25,000	2375

Works	Wastewater Treatment Plants	Scale (m ³ /d)	Wastewater Collected (m ³ /d)
	Lukong Town Wastewater Treatment Plant	350	125
Longhe River Embankment and Water Environmental Improvement Works of Shizhu County	Shizhu County Wastewater Treatment Plant	40,000	9520
Dianshui New District Wujiang River Flood Control and Slope Protection Works	/	/	/
Fujiang River Dafuba Section Water Environmental Improvement and Flood Control and Slope Protection Works at Tongnan County Seat	/	/	/

4.6.2 Due Diligence for Sewage Pipe Network

(1) Laixi River Integrated Improvement Works in Rongchang County

The existing sewage pipe network in the area of this component serves a population of 150,000 in Rongchang county town. The pipe diameter is d800-1000 mm and the sewage collected enters Rongchang Urban Sewage Treatment Plant for treatment. The newly-built sewage pipe network of this component is planned to collect the domestic sewage produced by a population of 40,000 along Laixi River. The length of the sewage pipe network is 12.3 km and its pipe diameter is 500-800 mm. The newly-built sewage pipe network will connect existing sewage intercepting main at Liansheng Bridge. Refer to attached drawing for sewage pipe network within the area.

(2) Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County

① Section from Longhe Bridge to Jiaoshi Stream estuary and section upstream from Jiaoshi Stream estuary

The newly-built sewage pipe network on left bank of these sections will connect to existing Geqiaoba sewage pipe network in Litangba New Area. The diameter of the latter is d800. The existing pipe network has enough surplus capacity to drain the sewage for the newly-built pipe network. The newly-built sewage pipe network on right bank of these sections will connect to the sewage pipe network for the section from Longhe Bridge to Shanxiashuiwu Sewage Pump Station at Longjing Bridge.

② Section from Longhe Bridge to Shanxiashuiwu Sewage Pump Station at

Longjing Bridge

The sewage pipe network of this section will connect to existing Shanxiashuiwu Sewage Pump Station.

③ Right-bank section from Niushiqian River estuary to Qiaotou Yard

This section will connect to existing sewage collection main of Shizhu Sewage collection and treatment Plant, and the diameter of existing drain main is d1300.

Refer to attached drawing for sewage pipe network within the area.

(3) Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

The sewage pipe network in Pengshui county town is mainly laid along the four banks of the two rivers. The combined rain-sewage discharge system is used as the drainage system. With a total length of 10.15 km, the sewage pipe network provides services for west and east of Wujiang River and Xueba area. For this component, three lifting pump stations will be constructed for the sewage pipe network completed, i.e. the lifting pump station to the west of Wujiang River, the lifting pump station to the east of Wujiang River, and the lifting pump station at Wujiang River Bridge No. 3. All inlets of these lifting pump stations will be set with intercepting wells to intercept rain water for directly discharging into Wujiang River. After being lifted by the lifting pump station to the east of Wujiang River, the sewage will enter a sewage collection and treatment plant via two DN 250 penstocks at the bottom of Yujiang River. After being lifted by the lifting pump station to the west of Wujiang River, the sewage will enter a sewage collection and treatment plant via two DN 250 penstocks laid on Dongshuimen Yangtze River Bridge and Qiansimen Jialing River Bridge. After being lifted by the lifting pump station at Wujiang River Bridge No. 3, the sewage will enter the next manhole and then flow into the lifting pump station to the east of Wujiang River by gravity. Refer to attached drawing for sewage pipe network within the area.

(4) Water Environment Protection and Flood control Revetment Integrated Improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

Since the sewage pipe network has not been connected for Dafuba District and the district is listed in the scope of 2010 ~ 2030 long-term planning zone of Tongnan urban area in the urban overall plan of Tongnan County, no development plan has been made for the near future. Based on the comments of the Owner and the Government of Tongnan County, no sewage collection and treatment works will be included in this component, so no discussion is made for such works in this section.

Table 4-15 Wastewater Treatment Plants Operating in the Project Towns

Component	WWTPs	Process	Designed Capacity (m ³ /d)	Current Wastewater Flow (m ³ /d)
Rongchang	Rongchang Municipal WWTP	Anearobic Tank and Oxidation Ditch	25,000	2375
	Lukong Town WWTP	Artificial fast filtration	350	125
Shizhu	Shizhu WWTP	Sequential batch reactor	40,000	9520

4.6.3 Due Diligence for Flood Control Works

(1) Laixi River Integrated Improvement Works in Rongchang County

In overall planning for flood control of Rongchang county town reaches, it is required that the river bank treatment length should be 19.8 km. The length of treated river banks is 8.2 km for Changzhou and Changyuan subdistricts in the county (middle reaches from Shiji Bridge to Old Liansheng Bridge, with the river channel length being 4.3 km) and the length of untreated river banks is about 11.6 km (upper reaches from Shabu Hydropower Station to Old Liansheng Bridge, with the river channel length being about 4.3 km; lower reaches from Shiji Bridge to Old Chengdu-Chongqing Railway, with the river channel length being about 1.7 km). The length of river channel under the treatment planning is about 12.8 km (with the treatment river bank line about 25.6 km long). The river reaches planned to be treated start at the junction of Lukong Town and Dazu County and ends at Shabu Hydropower Station. Within the treatment scope, the flood control standard is mainly of 10-year flood, but 20-year flood is adopted for Lukong Ancient Town, with the protection scope running from Lukong Town to both banks of Changzhou.

(2) Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County

According to *Overall Planning for Shizhu County, Chongqing Municipality (2005-2020)*, the flood control standard for central urban area of Shizhu County should be 20~10-year flood. The flood control standard for all embankments completed in the urban area is 10-year flood, so a 10-year flood control standard will be adopted for this component, which can meet the planning requirement of Shizhu County.

(3) Flood control Revetment and Integrated Improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

According to *Construction Scheme for Flood Control System of Pengshui County, Chongqing Municipality* (replied and approved by YX [2009] No. 5 Document), the

flood control standard for embankments of the two rivers in Pengshui county town should be 20-year flood, so a 20-year flood control standard will be adopted for this component, which can meet the flood control standard of Pengshui County.

(4) Water Environment Protection and Flood control Revetment Integrated Improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

According to flood control planning of Tongnan County, the embankments of Sankuaishi District, the embankments of Dafuba District and the revetments of vegetable base reaches are three major parts of Phase III Embankment (Revetment) Works in Tongnan County. This component involves the embankments of Dafuba District, which is an important part of Phase III Embankment (Revetment) Works, so its flood control safety could be improved. When all Phase III Embankment (Revetment) Works are completed, it will form an integrated flood control system together with the existing Phase I and Phase II embankments and the embankments in the Giant Buddha Temple scenic spot. In addition, the flood control standard for its river reaches will be improved to 20-year flood.

4.6.4 Due Diligence for Sludge Disposal Site

(1) Laixi River Integrated Improvement Works in Rongchang County

The sewage collected by this component will enter Rongchang Urban Sewage collection and treatment Plant and Lukong Sewage collection and treatment Plant for treatment, and the sludge from sewage collection and treatment will be dehydrated before being transported to Jiangjiagou Landfill for sanitary landfill disposal.

Jiangjiagou Landfill is located in Jiangjiagou, Qibao Village, Changyuan Town, Rongchang County, 1.5 km away from Rongchang and about 300 m away from Laixi River, with the design capacity (scale) of 1,930,000 m³ and a service life of 15 years. It passed the environmental protection acceptance in 2008 and its main task is to provide sanitary landfill treatment for domestic refuse. Jiangjiagou Landfill has been constructed with a seepage control system, a leachate collection system and a landfill gas collection system. The leachate treatment facilities have a daily treatment capacity of 70 t and apply the "biological aerated filter" treatment technology. The designed daily receptivity of the refuse landfill is 300 t from 2008 to 2023, and its current receptivity and treatment capacity is 180 t. The daily-added sludge produced by this component will be 1 t. Therefore, Jiangjiagou Landfill in Rongchang County can meet the requirement for treatment of the newly-added sludge produced by this component.

(2) Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County

The sewage collected by this component will enter Shizhu Sewage collection and treatment Plant for treatment, and the sludge from sewage collection and treatment will be dehydrated before being transported to Caidiba Refuse Landfill for sanitary landfill disposal.

Caidiba Refuse Landfill is located in Caidiba. It was constructed in 2011 and it passed the environmental protection acceptance in December 2012. Its main task is to provide sanitary landfill treatment for domestic refuse. For the refuse landfill, the designed service life is 13.5 years and the designed daily treatment capacity is 280 t/d. Currently, its daily treatment capacity is 200 t/d. Caidiba Refuse Landfill has been constructed with a seepage control system, a leachate collection system and a landfill gas collection system. The leachate treatment facilities have a daily treatment capacity of 75t and apply the "biological aerated filter" treatment technology. The daily-added sludge produced by this component will be 4 t. Therefore, Caidiba Refuse Landfill can meet the requirement for treatment of the newly-added sludge produced by this component.

(3) Flood control Revetment and Integrated Improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

Due to great uncertainty in the planning for Pengshui component, the treatment capacity and location of Xujiaba Sewage collection and treatment Plant have not been determined yet, so no discussion is made for sludge disposal site of the sewage collection and treatment plant in this section.

(4) Water Environment Protection and Flood control Revetment Integrated Improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

Since Tongnan component only involves flood control, not includes sewage collection and treatment, no discussion will be made for sludge disposal site of the sewage collection and treatment plant in this section.

4.6.5 Due Diligence for Construction Spoil Disposal Site

(1) Laixi River Integrated Improvement Works in Rongchang County

The total amount of earthwork to be discharged in this component is 175,700 m³(bank measure), which will be transported to Huangjinpo public waste site for stacking. The newly built Huangjinpo public waste site, which is neighbor to the Huangjinpo administrative committee beside the High-speed rail station, will be operated by the Committee. The total capacity of the site is around 300,000m³, with remaining capacity of 300,000m³. The committee now has agreed to receive the disposal site, as the agreement refers to Rongchang attachment 4.

(2) Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County

The amount of earthworks to be discharged by this component is 163,900 m³(bank measure), which will be transported to Diaozhui public waste site for stacking, which is located at the downstream of the project river called "Diaozhui". The coverage of the site is 38000m², with average stacking height of 8 m. The total capacity of the site is 304,000m³ with remaining capacity around 200,000m³.

The amount of sludge in this component is 74,000 tons, which will be transported to Yaodianzi waste treatment plant as mulching soil. The waste treatment plant is located at the place called "Yaodianzi" in Sizhu county, with daily treatment capacity of 150 tons and the land coverage of 13,200m². The designed service-life for this plant is 11 years. The Yaodianzi treatment plant, mainly for the landfill of domestic waste, has been constructed with a seepage control system, a leachate collection system and a landfill gas collection system. The leachate facilities have a daily treatment capacity of 70 t and apply the "biological aerated filter" treatment technology. The silt disposed in this component will be dried in the sun at the treatment plant, and be used as mulching soil, which has been agreed to be received by the LIMING Waste Treatment Plant, as refer to the agreement in Sizhu attachment 3.

(3) Flood control Revetment and Integrated Improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County

The total amount of earthwork to be discharged in this component is around 371,200 m³(bank measure). Since the restrictions of the steep hills and administrative of different villages, there are two construction-waste disposal sites are proposed in this component: The site I, which is proposed 750 m upstreams away from the starting-point of the project, just closing to the Sihuituo backfill Site, covers the area of 19,600 m², with the total volume of 100,000 m³. The site II, is the Sihuituo backfill Site, which will start for using after the ending of the backfill at the site. The Sihuituo backfill site covers the land of 17,200 m², with the total volume of 300,000m³. The city construction investment Co., Ltd has agreed to receive the two disposal sites for operation, as refer to the agreement in Pengshui attachment 5.

(4) Water Environment Protection and Flood control Revetment Integrated Improvement Works for Dafuba Reaches of Fujiang River in Tongnan County

The total amount earthwork to be discharged in this component is 301,600m³(bank measure), which will be transported to four disposal sites located at the low-lying behind the embankment. The four sites cover the land area of 6.7542ha, 4.56ha, 0.71ha and 2.1112 ha respectively, and each site has the volume of 136,000m³, 80,000m³, 25,000m³ and 60,600m³ for disposal separately.

4.6.5 Industrial Pollution Control in the Project Area

Based on data from investigations of current status of land and planned industrial zones in project areas of the 4 project components, only Shizhu project component involves industrial enterprises existing at the upper stream of its project area, and industrial enterprises exist only along both river banks involved in Shizhu project assessment area, within the scope of the other 3 project components there are no industrial enterprises. According to the investigations, waste water from the industrial enterprises within the project assessment area of Shizhu project component is all directly discharged into waste water collection pipes and then enters into wastewater treatment plant, without discharging into Longhe River, thus industrial waste water is under effective control.

According to the planning maps relating to the land areas involved in the 4 project components, only along the left bank of Longhe River involved in Shizhu project component there are planned industrial enterprises, and the planned enterprises all have waste water collection pipes for collection of waste water before treatment in the waste water treatment plant. There are no planned industrial zones in the assessment areas of the other 3 project components.

5 Current Situation of Environment Quality

5.1 Noise

Refer to Table 5-1 for the monitoring agency, monitoring date and monitored value and assessment result of acoustic environment quality monitoring at the sites of the four components and Urban Network component. The monitoring points are shown in the attached drawing.

Table 5-1 Investigation and Assessment Results of Current Acoustic Environment Quality at the Site of Chongqing Small Town Water Environment Improvement Project under World Bank Loan
Unit: dB (A)

Component	Monitoring Date	Monitoring Agency	Monitoring Point	Day			Night		
				Monitored Value	Standard	Assessment Result	Monitored Value	Standard	Assessment Result
Laixi River Integrated improvement Works in Rongchang County	October 17-18, 2013	Rongchang Environment Monitoring Station	Lukong Town	46.6~47.1	60	Conforming	37.3~37.4	50	Conforming
			A settlement in Dujiaba	46.5~46.8			35.6~36.4		
			A settlement in Erlangtan	45.4~46.9			36.3~37.1		
Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	September 10-11, 2013	Shizhu Environment Monitoring Station	Hongxing Village, on the right bank of Jiaoshi Stream estuary	52~53	60	Conforming	43.6~44.1	50	Conforming
			Shuangqing Community, at east bridgehead of Longhe Bridge	53.9~54.9			42.4~44.9		
			Qiaotou Yard, on right bank of Niushiqian River	54.1~54.8			43~43.5		
			Zhongba Village, at west bridgehead of Zhongba Bridge	53.1~53.5			41.5~42.1		
Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui	September 29-30, 2013	Wulong Environmental Protection Monitoring	Linjiang Group 1	45.7~46.6	60	Conforming	37.6~38.7	50	Conforming

New Town, Pengshui County		Station							
Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County	May 14-15, 2012	Tongnan Environment Monitoring Station	Hongyanzui Lift Irrigation Station in Xinsheng Village, Dafuba District	50.0~50.3	60	Conforming	38.1~38.4	50	Conforming
			Qianjin Village	45.2~45.5	55	Conforming	37.3~37.5	45	Conforming
			Shengli Village Group 1	45.4~46.5	60	Conforming	36.2~37.6	50	Conforming

As shown by the above monitoring data, the acoustic environment quality is good at the sites of the four components.

5.2 Atmospheric Environment

Refer to Table 5-2 for the monitoring data, monitoring agency, monitoring date and assessment result of ambient air monitoring at sites of all components. The monitoring points are shown in the attached drawing.

Table 5-2 Monitoring and Assessment of Current Situations of Atmospheric Environment

Component	Monitoring Agency	Monitoring Date	Description of Current Situation Measuring Point	Pollutant	Range of Concentration (mg/m ³)	Rate of Exceeding the Standard, %	Ratio of Maximum Concentration to Standard Concentration (%)	GB3095-2012 Grade II Standard	EHS Guideline Value
Component	Rongchang Environment Monitoring Station	April 19-25, 2013	Changyuan Town, Rongchang County	PM ₁₀	0.0363~0.1334	/	88.93	0.15	0.125
				SO ₂	0.0554~0.1228	/	98.24	/	
				NO ₂	0.0247~0.0517	/	64.63	0.08	
	December 17-23, 2013	A settlement in Lukong Town	TSP	0.154~0.164	/	54.67	0.30		
Longhe Urban	Shizhu	January 1-7,	Urban area of	SO ₂	0.0154~0.0587	/	46.96	/	0.125

Embankment and Water Environment Integrated improvement Works in Shizhu County	Environment Monitoring Station	2013	Shizhu County	NO ₂	0.0105~0.0342	/	42.75	0.08	
				TSP	0.0669~0.1124	/	37.47	0.30	
Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Wulong Environmental Protection Monitoring Station	September 24-30, 2013	Linjiang Group 1	SO ₂	0.006~0.109	/	87.2	/	0.125
				NO ₂	0.025~0.11	37.5	137.5	0.08	
				TSP	0.040~0.084	/	28	0.30	
Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County	Tongnan Environment Monitoring Station	May 9-15, 2012	Environmental Protection Bureau of Tongnan County	PM ₁₀	0.017~0.034	/	22.67	0.15	
				SO ₂	0.006~0.051	/	40.8	/	0.125
		December 20-26, 2013	Qianjin Village, in the middle of Dafuba embankment	NO ₂	0.01~0.016	/	20	0.08	
				TSP	0.082~0.093	/	31	0.30	

According to the monitoring results, the ratio of maximum concentration to standard concentration for each pollutant in the ambient air of Rongchang component, Shizhu component and Tongnan component is less than 1, complying with the Grade II standard requirements in *Ambient Air Quality Standards* (GB3095-2012) and presenting good ambient air quality. The concentration of NO₂ in the ambient air of Pengshui component has exceeded the standard concentration by 37.5%, failing to comply with Grade II standard requirements in *Ambient Air Quality Standards* (GB3095-2012). The NO₂ of Pengshui component mainly comes from domestic use of coal and emission of small coal-fired boiler rooms.

5.3 Water Environment

Refer to Table 5-3 for the current situation investigation, monitoring agency, monitoring date and assessment result of water environment for relevant major rivers at sites of all components. The monitoring points are shown in the attached drawing.

Table 5-3 Assessment of Current Situation of Water Quality of Major Rivers Related to All Components (Unit of Concentration: mg/L; Dimensionless for pH)

Component	Monitoring Agency	Monitoring Date	Monitoring Section	Monitoring Factor	pH	COD _{Cr}	BOD ₅	NH ₃ -N	TP	Fecal Coliform
Laixi River Integrated improvement Works in Rongchang County	Rongchang Environment Monitoring Station	January 2011 ~ November 2013	Jiebei section, Laixi River	Monitored Value	6.18~8.86	16.5~29.3	1.25~5.2	0.109~1.77	0.03~0.41	200~54000
				Ratio of monitored value to standard value	/	0.825~1.465	0.313~1.3	0.109~1.77	0.15~2.05	0.02~5.4
			Gaodong Hydropower Station section, Laixi River	Monitored Value	6.29~8.31	15.2~29.7	2.05~4.5	0.159~3.89	0.03~0.384	500~2240000
				Ratio of monitored value to standard value	/	0.76~1.485	0.513~1.125	0.159~3.89	0.15~1.92	0.05~224
			Standard for Class III water area	Standard value	6~9	20	4	1.0	0.2	10000
Longhe Urban Embankment and Water Environment Integrated improvement Works in Shizhu County	Shizhu Environment Monitoring Station	2010~2012	Modao Stream section, Longhe River	Monitored Value	7.21~7.46	5.0~8.0	1.0~1.86	0.203~0.342	0.028~0.053	1575~1733
				Ratio of monitored value to standard value	/	0.25~0.4	0.25~0.465	0.203~0.342	0.14~0.265	0.158~0.173
			Huhaichang section, Longhe River	Monitored Value	7.61~7.87	7.95~13.9	1.09~2.22	0.275~0.40	/	/
				Ratio of monitored value to standard value	/	0.398~0.695	0.273~0.555	0.275~0.40	/	/
			Standard for Class III water area	Standard value	6~9	20	4	1.0	0.2	10000

Flood control Revetment and Integrated improvement Works of Riverside Section of Wujiang River in Dianshui New Town, Pengshui County	Wulong Environmental Protection Monitoring Station	2011~2012	Lujiao section, Wujiang River	Monitored Value	7.32~8.80	5.0~11.4	1.00	0.06~0.59	0.226~1.2	310~2467
				Ratio of monitored value to standard value	/	0.25~0.57	0.25	0.06~0.59	1.13~6	0.031~0.247
			Standard for Class III water area	Standard value	6~9	20	4	1.0	0.2	10000
Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches of Fujiang River in Tongnan County	Tongnan Environment Monitoring Station	2006~2010	Dam site of Shuangjiang Cascade Hydropower Station	Monitored Value	7.50~ 7.54	18.3~19.8	2.05~ 2.11	0.214~ 0.223	0.068-0.070	4900~7900
				Ratio of monitored value to standard value	/	0.915~0.99	0.513~0.528	0.214~ 0.223	0.34~0.35	0.49~0.79
			100 m upstream of Sankuaishi Barrage	Monitored Value	7.46~ 7.52	16.3~ 17.1	2.07~ 2.10	0.175~ 0.183	0.07~ 0.07	4900~7900
				Ratio of monitored value to standard value	/	0.815~0.855	0.518~0.525	0.175~ 0.183	0.35~0.35	0.49~0.79
			Dam site of Tongnan Cascade Hydropower Station	Monitored Value	7.44~ 7.52	18.5~ 19.3	2.21~ 2.32	0.367~ 0.379	0.068-0.07	3300~4900
				Ratio of monitored value to standard value	/	0.925~0.965	0.553~0.58	0.367~ 0.379	0.34~0.35	0.33~0.49
			Dam site of Fujin Cascade Hydropower Station	Monitored Value	7.50~7.56	17.0~ 17.8	2.19~2.32	0.311~ 0.318	0.077-0.078	3300~4900
				Ratio of monitored value to standard value	/	0.85~0.89	0.548~0.58	0.311~ 0.318	0.385~0.39	0.33~0.49
			Standard for Class III	Standard value	6~9	20	4	1.0	0.2	10000

			water area							
--	--	--	------------	--	--	--	--	--	--	--

According to the monitoring results, each monitoring index of Longhe River of Shizhu component and Fujiang River of Tongnan component meets the limit values for Class III water area in Surface Water Environmental Quality Standards (GB3838-2002), which indicates relatively good water quality and certain environmental capacity of the evaluation area of the Project; the monitoring indexes of Laixi River of Rongchang component and Wujiang River of Pengshui component fail to meet the standard requirements for Class III water area in Surface Water Environmental Quality Standards (GB3838-2002), and the main reason lies in that domestic sewage from households along the river banks is discharged into the rivers directly without collection.

5.4 Quality of Dredging Sludge

Among the four components of the Chongqing Small Town Water Environment Improvement Project, only the Longhe Urban Embankment and Water Environment Integrated Improvement Works in Shizhu County contain a 2,262 m dredging section at Niushiqian river channel. Dredging sludge will be produced. Based on the investigations carried out around the upper and lower reaches of this river course, the major pollution sources include daily domestic sewage indiscriminately discharged from residences and farmland backwater etc. flowing into the water body of this river course along with the surface runoff. Residences and a few enterprises and public institutions lie around the confluence between Niushiqian River and Longhe River. The sewage produced in this region is collected by sewage pipe network of Shizhu County and treated by sewage collection and treatment plant before being discharged into the Longhe River rather than Niushiqian River, and this river channel is free of heavy metal pollution emission sources such as direct sewage discharge from factories etc. Chongqing Mineral Resources Supervision and Test Center of Ministry of Land and Resources of the People's Republic of China has detected the contents of sludge contaminants at this river channel, with details as follows:

(1) Monitoring factors: pH value, copper, zinc, lead, cadmium, chromium, nickel, mercury and arsenic.

(2) Monitoring point: 1 sampling point taken at dredging reach of Niushiqian river channel.

(3) Monitoring time and frequency: soil sampled on February 10, 2014.

(4) Sampling and analysis methods

All monitoring methods comply with relevant requirements of *Guidelines for Sample Analysis Method and Quality Management of 1:50000 Regional Geological Investigation and Geochemical Survey (DZG20.10-1990)*, *Specifications for Multi-purpose Regional Geochemical Survey (1:250000) (DD2005-01)*.

(5) Monitoring results and analysis

Refer to table 5-4 for monitoring results of dredging sludge.

Table 5-4 Monitoring Results of Current Conditions of Dredging Sludge Unit: mg/kg (dry sludge)

Monitoring Point Monitoring Items	Dredging Reach of Longhe River
pH	7.42
Copper	47.5
Zinc	151
Lead	61.3
Cadmium	1.23
Chromium	62.2
Nickel	40.1
Mercury	0.15
Arsenic	8.22

Based on the monitoring results, the sludge ingredients at dredging section of Longhe River meet the neutral and alkaline soil standard values in *Control Standard for Pollutants in Sludges for Agricultural Use* (GB4284-84) and meet requirements in *Treatment and Disposal of Sludge from Urban Wastewater Treatment Plant: Quality of Sludge for Garden and Greening Uses* (GB/T23486-2009) and in *Treatment and Disposal of Sludge from Urban Wastewater Treatment Plant: Quality of Sludge for Mixed Filling in Landfill* (GB/T23485-2009).

6 Environmental Impact Analysis

6.1 Experiences and Lessons Learnt from Previous Projects under World Bank Loan in the Project Area

The Chongqing World-Bank-Loan Project Office was founded in October 1993, and has been developing 6 projects under World Bank loan, including: (1) the completed projects: Chongqing Industrial Reform and Pollution Control Project, Chongqing Urban Environmental Project, a sub-project from the balance of the Chongqing Urban Environment Project and Chongqing Small Town Environmental Improvement Project under World Bank Loan; and (2) the ongoing projects: Chongqing Coordinated Urban-rural Development and Reform Project Phase I and Chongqing Coordinated Urban-rural Development and Reform Project Phase II.

The Chongqing World-Bank-Loan Project Office has gained some experiences and lessons in environmental management for the projects under World Bank loan from the long-term participation in management and coordination jobs of the projects under World Bank loan. The major experiences are as follows:

6.1.1 Conduct Special Environmental Management Throughout the Project

Conduct the special environmental management throughout the whole project.

(1) In the feasibility study stage of the Project, employ independent environmental experts to guide the environmental assessment developed by project entities and to ensure that the environmental protection factors are taken fully into account for the Project. The environmental experts shall guide and prepare the feasible environmental management and monitoring plan.

(2) In the project design stage, employ independent design review agencies to review if relevant environmental protection designs have been accommodated in the overall design of the Project and further optimize and perfect the environmental protection design;

(3) In the project bidding stage, the Owner shall integrate the environmental management plan as part of the Bidding Documents and ensure that the environmental protection works are implemented.

(4) In the project initiation stage, the project management company shall conduct special trainings in environmental management and for strengthening the environmental awareness for the Owner, the Supervisor and relevant parties, and will conduct the trainings at any time in the future.

(5) In the project implementation stage and completion stage, regularly

monitor, inspect and report to timely find out the problem.

6.1.2 Implement Environmental Management Organization and Management System

A sound management organization and a complete management system are the guarantee for environmental management. The Chongqing World-Bank-Loan project environmental management system consists of a management organization, a coordination organization, an execution organization and a consultation organization. The four organizations closely coordinate and effectively cooperate with each other to conduct the environmental protection works of project. Refer to the section of Environmental Management Plan for Diagram of Environmental Management Organization and Management System.

6.1.3 Attach Importance to Environmental Supervision Management and Monitoring

Conducting regular field supervision and regular monitoring in accordance with the environmental monitoring plan is conducive to finding out the possible problems during the implementation of the Project and making improvements.

As a whole, the Chongqing World-Bank-Loan Project Office has gained rich experiences from participation in the projects under World Bank loan, and found out some problems during the environmental management, mainly including:

(1) Conceptual limitation: some of the project entities are not familiar with the environmental protection requirements of the projects under World Bank loan and are conceptually limited in development of environmental assessment of the Project and specific implementation of the EMP, so they are prone to comply with the requirements in China.

(2) Resource limitation: environmental experts who are familiar with the environmental protection requirements of the projects under World Bank loan are in a limited number.

6.1.4 Take Measures for Follow-up Project

To solve the above-mentioned problems, the Chongqing World-Bank-Loan Project Office has taken the following remedial measures:

(1) Strengthen the training course for the project implementers and relevant parties since the commencement of planning the Project, and invite environmental assessment experts of the World Bank to conduct the training course in Chongqing for many times. Besides, invite qualified project management company familiar with

the safeguard requirements of the World Bank to regularly conduct the training course and supervise and guide the environmental management developed by project entities.

(2) Effectively proceed the safeguard works of the Project with years of management experiences of the projects under World Bank loan and Central PMO as the guarantee, and gradually establish an expert database familiar with the projects under World Bank loan.

6.2 Environmental Impact Prediction and Assessment during Construction

6.2.1 Prediction and Assessment of Acoustic Environmental Impact

The noise effect during construction mainly focuses in the concentration area of construction such as embankment works etc. and sewage pipeline construction area, and the noise source is dominated by construction machinery.

6.2.1.1 Construction Noise in Concentration Area of Construction such as Embankment Works Etc.

(1) Noise source

The noise during construction mainly arises from earth-rock excavation, material yard excavation, transportation and materials loading and unloading etc. The noise source during construction is dominated by construction machinery, dynamic equipment and vehicles etc. According to the measured data of common machinery, the noise source intensities are shown in table 6-1.

Table 6-1 List of Noise Source Intensities of Construction Machinery

S/N	Type of Machinery	Distance between Test Point and Construction Machinery (m)	Maximum Noise Level Lmax (dB)
1	Excavator	5	90
2	Bulldozer	5	86
3	Vibrating roller	5	90
4	Ramp roller	5	86
5	Frog rammer		90
6	Vibrator	5	81
7	Mortar mixer	5	76
8	Electric welding machine	1	86
9	Air compressor	5	87

(2) Prediction mode

According to the formula recommended in the *Technical Guidelines for Noise*

Impact Assessment - Acoustic Environment HJ2.4-2009, the calculation formula is as follows:

$$L_p(r) = L_p(r_0) - (A_{div} + A_{atm} + A_{bar} + A_{gr} + A_{misc})$$

Where: $L_A(r)$ - A-weighted sound level at a distance of r from the noise source, dB;

$L_A(r_0)$ - A-weighted noise level at reference position r_0 , dB;

A_{div} - attenuation of A-weighted noise level caused by geometrical spreading of sound wave, dB;

A_{div} - attenuation of A-weighted noise level caused by geometrical spreading of sound wave, dB;

$$A_{div} = 20 \lg(r / r_0)$$

A_{bar} - attenuation of A-weighted noise level caused by obstruction, dB;

A_{atm} - attenuation of A-weighted noise level caused by air absorption, dB;

A_{gr} - attenuation of octave frequency band caused by ground effect, dB;

A_{bar} - attenuation of octave frequency band caused by noise barrier, dB;

A_{misc} - attenuation of octave frequency band caused by other effects in multiple aspects, dB.

According to the noise superposition method, the noise level superposition formula is:

$$L_A(\text{total}) = 10 \lg \left(\sum_{i=1}^n 10^{0.1L_i} \right)$$

Where: $L_A(\text{total})$ - total noise level value after superposition, dB (A);

L_i - noise level value of No. i noise source at some point, dB (A); n - number of noise sources.

(3) Prediction and analysis of distance attenuation of construction noise

① Prediction result

Since the construction area is relatively large, noise may be attenuated to some extent during spreading. The noise values of each set of equipment after different distance attenuations are shown in table 6-2.

Table 6-2 Noise Levels at Different Distances from Construction Machinery

Description of Machinery	Distance from Construction Machinery (m)									
	5	10	20	40	60	80	100	150	200	300
Excavator	84	78	72	66	62	60	58	54	52	48
Bulldozer	86	80	74	68	64	62	60	56	54	50
Vibrating roller	90	84	78	72	68	66	64	60	58	54
Air compressor	87	81	75	69	65	63	61	57	55	51
Tamping machine	90	84	78	72	68	66	64	60	58	54
Electric welding machine	80	74	68	62	58	56	54	50	48	44
Agitator	76	70	64	58	54	52	50	46	44	40

② Analysis of impact

Since the construction is subject to outdoor works and there are no sound insulation or noise elimination measures, the noise may spread relatively far, so the management during construction must be reinforced. According to the *Emission Standard of Environment Noise for Boundary of Construction Site* (GB12523—2011), the noise limit in daytime is 70 dB (A) and the noise limit at night is 55 dB (A).

It can be seen from table 6.2-2 that, in case of no noise barriers for construction machinery, the standard noise limit specified in the *Emission Standard of Environment Noise for Boundary of Construction Site* (GB12523—2011) can be reached at the distance of 50 m from the construction site under the noise of construction machinery in daytime, and the standard noise limit specified in the *Emission Standard of Environment Noise for Boundary of Construction Site* (GB12523—2011) can be reached at the distance of 300 m from the construction site at night.

The engineering transportation noise may impact the residences on two sides of the road to some extent. However, since construction is carried out in different stages in the Project, each stage is subject to relatively short construction period and

the range within the land acquisition red lines of the Project contains the major traffic volume, the degree of impact is limited with appropriate measures taken and effective management.

According to the construction schedule, the proposed project shall be subject to construction in daytime instead of at night. Due to the uncertainty of operations of construction machinery, the equipment with the highest noise source intensity (the vibrating roller) is selected for assessment and prediction of impact of noise on sensitive points around, with reference to the similar projects, the sound pressure level can be reduced by 15 dB (A) with mobile noise barrier and fence at boundary of construction site, the prediction results are shown in table 6-3.

Table 6-3 Impact of Noise of Construction Machinery (in Daytime) on Sensitive Points (Unit: dB (A))

Component	Construction Machinery	Noise Source Intensity	With Partial Sound Insulation Measures Taken	Sensitive Site	Distance (m)	Contribution Value	Predicted Value
Tongnan component	Vibratory roller	90	90	No. 1 construction site ES: 1 household	20	63	63.1
				No. 1 construction site E: 1 household	39.5	57	57.4
				No. 1 construction site ES: 1 household	41.5	56.6	57.0
				No. 1 construction site ES: 2 households	40.2	56.9	57.3
				Yutong Wenwu School of Tongnan County	20	63	63.1
Rongchang Component				Darongzhai Community Group 7: 1 household	36	57.9	58.2
				Darongzhai Community Group 7: 1 household	41	56.7	57.2
				Darongzhai Community Group 7: 1 household	34.5	58.2	58.5
				Darongzhai Community Group 6: 1 household	11.5	67.8	67.8
				Darongzhai Community Group 6: 2 households	15.7	65.1	65.2
	Darongzhai Community Group 6: 1 household	19.5	63.2	63.3			
	Darongzhai Community Group 6: 1 household	24.5	61.2	61.4			

Component	Construction Machinery	Noise Source Intensity	With Partial Sound Insulation Measures Taken	Sensitive Site	Distance (m)	Contribution Value	Predicted Value
				Darongzhai Community Group 6: 2 households	35	58.1	58.4
				Darongzhai Community Group 6: 1 household	35.5	58	58.3
				Darongzhai Community Group 6: 3 households	12.5	67	67.0
				Darongzhai Community Group 5: 1 household	23.7	61.5	61.7
				Darongzhai Community Group 5: 1 household	24.5	61.2	61.4
				Darongzhai Community Group 5: 1 household	32.2	58.8	59.1
Rongchang Component				Yuding Village Group 8: 1 household	33.5	58.5	58.8
				Baochengsi Group 2: 1 household	32	58.9	59.2
				Baochengsi Group 1: 1 household	46.5	55.6	56.2
				Shabu Village Group 1: 1 household	24	61.4	61.6
				Shabu Village Group 1: 1 household	26.7	60.4	60.6
				Shabu Village Group 1: 2 households	39.5	57	57.4
Shizhu component				Hongjing Community: 5 households	16.9	64.4	64.9
				Hongjing Community: 10 households	24.6	61.2	62.1
				Hongjing Community: 4 households	34.5	58.3	59.9
				Hongjing Community: 4 households	45.6	55.9	58.4
				Shuangqing Community: 2 households	15.6	65.1	65.5
				Shuangqing Community: 6 households	32.6	58.8	60.3
				Shuangqing Community: 6 households	41.6	56.7	58.9
				Residents from Hongxing Village: 2	11	68.2	68.4

Component	Construction Machinery	Noise Source Intensity	With Partial Sound Insulation Measures Taken	Sensitive Site	Distance (m)	Contribution Value	Predicted Value
Pengshui component				households			
				Residents from Hongxing Village: 3 households	28.9	59.8	61.0
				Southwest Liren Hospital	30	59.4	60.7
				Linjiang Group 7: 2 households	40	56.9	57.3
				Linjiang Group 8: 3 households	20	63	63.1
				Linjiang Group 9: 2 households	11	68.2	68.2
				Zhangjiaba Group 5: 2 households	21	62.5	62.6

6.2.1.2 Construction Noise of Sewage Conduit

The noise during construction is dominated by machinery noise, construction noise and construction vehicle noise. Compared with the major construction site such as embankment works etc., the construction machinery is in a far fewer number, the noise source intensity is lower (about 80 dB (A)), the construction period is shorter (the construction may stay at one village for about 1 ~ 2 days), and the noise effect may disappear after the construction.

Since the machinery equipment adopted for construction is subject to different combinations, the noise effect degrees are not the same. Prior to laying of sewage conduit, most sets of the equipment (mainly including excavator and loader) adopted in the breaking stage for some pavements are high-noise machinery characterized by long duration and high intensity of noise. In contrast, the noise arising from the sewage conduit works is relatively low and less large machinery equipment is adopted, the major cause of this is that only the manual earth excavation can be adopted due to the restrictions at some sections, so the construction noise effect on environment is relatively low.

The construction noise mainly includes some sporadic knocking noise, impact sound made by loading and unloading vehicles, crying-out noise and strike noise etc., most of which belong to instantaneous noise. The noise made by construction vehicles belongs to traffic noise characterized by a short duration and therefore can impact on environment to a limited extent.

6.2.2 Prediction and Assessment of Impact on Ambient Air Quality

The construction sites of proposed project and 4 components are free of in-situ mixing of concrete and asphalt. The major pollution sources during construction are dominated by dust arising from construction sites and roads, in which the pollutant is TSP, and supplemented by a little fuel waste gas produced by the construction machinery, in which the pollutants are CO, NO_x etc.

(1) Prediction and analysis of dust (TSP) arising from construction

The earth excavation and filling, exploitation of material yard and waste disposal for the Project will impact on the air environment in the construction area to some extent.

The severity of dust arising from the construction site is related to many factors such as construction site conditions, construction method, construction equipment and construction seasons, weather conditions and soil properties in construction area etc. The major cause of the dust arising from construction is the blown dust from open stockpile and bare area. In accordance with the construction requirements, some construction materials need to be stockpiled in open stockpile. The surface soil on some construction sites needs to be manually excavated and stockpiled, which may cause dust at some places subject to dry and windy weather. Analysis of impact by dust of this Project has been done with reference to the monitoring data during construction of other water projects (refer to table 6-4).

Table 6-4 Pollution of Dust from Construction Site - Comparison of TSP Concentration Change

Location of Monitoring Points		Dry Construction Site	Watered Construction Site
TSP concentrations at different distances from construction site (mg/m ³)	10m	1.75	0.437
	20m	1.3	0.35
	30m	0.78	0.31
	40m	0.365	0.265
	50m	0.345	0.25
	100m	0.33	0.238

It can be seen from table 6-4 that the TSP concentration 30 m downwind from the construction site has already been lower than the fugitive emission monitoring concentration limit of particulates (1.0 mg/m³) specified in *Integrated Emission Standard of Air Pollutants* (GB16297-1996). After the construction site has been watered, the TSP concentration drops significantly, and the Class II standard of the *Ambient Air Quality Standard* can be reached within the range of 40 m. Therefore, dust may impact on the residences within the range of 40 m from the construction area during construction.

Based on the field investigation, the sensitive points related to residences etc.

within the range of 40 m from the construction site of each component are shown in table 6-5.

Table 6-5 List of Sensitive Points to Dust during Construction

Component Name	Number of Sensitive Points
Rongchang component	About 24 households, 82 people
Shizhu component	About 216 households, 756 people
Tongnan component	About 5 households, 18 people
Pengshui component	About 14 households, 56 people

(2) Prediction and analysis of dust (TSP) arising from road

The intensity of dust produced by construction vehicles passing through construction road is related to distance from dust source, surface of construction road and running speed. Generally, the range impacted by dust produced by vehicles under the natural wind is within 100 m. Based on prediction, the dust can be reduced by about 70% by watering the pavement on which vehicles are passing for 4 ~ 5 times every day during construction. Refer to the watering experiments to reduce dust which have been done in the similar projects to ensure that the dust arising from construction can be effectively reduced by watering. The results of watering experiments to reduce dust on construction site are shown in table 6-6.

Table 6-6 Results of Watering Tests to Reduce Dust during Construction

Distance from Construction Site/m	Measures Adopted	5m	20m	50m	100m
Average hourly TSP concentration (mg/ m ³)	No watering	10.14	2.89	1.15	0.86
	Watered	2.01	1.40	0.67	0.60

Frequently watering the construction road can effectively reduce the dust pollutions. There are fewer sensitive points around the construction area and construction road of the Project. Taking watering measures can significantly mitigate the adverse effect of dust arising from road on environment, besides, the watering measures can hardly impact on environment.

(3) Analysis of impact of exhaust of machinery equipment

Since construction machinery is subject to intermittent operation and in a fewer number, it can be predicted based on the pollutant emissions in exhaust of construction machinery for each construction section in the same type of the project that the CO and NO_x pollutants in the exhaust of construction machinery during construction are subject to low emissions, and the impact of operation of construction machinery equipment on ambient air is mainly limited within the construction area. Since the Project lies beside river and is prone to river wind,

pollutants can easily spread during construction. Although there are residences around the project route, they can be hardly impacted by air pollutions during construction, and this kind of impact will disappear upon completion of the construction.

(5) Analysis of impact of dredging sludge drying field

According to the engineering contents of each component, the Shizhu Component involves dredging works of river channel, in which obnoxious gas may arise from the accumulation of sludge, mainly including $\text{NH}_3\text{-N}$ and H_2S , and generally the odor strength is Class 2 - Class 3.

Based on the characteristics of the Project and environmental conditions around, this assessment shall adopt the Class II standard in *Emission Standards for Odor Pollutants* (GB14554-93).

① Classification of odor strength

The classification of odor strength is based on the odor threshold. So far the odor strength has been divided into 6 classes in China. Refer to table 6-7 for details. Generally, the limit standard corresponds to Class 2.5 ~ Class 3.5 of odor strength. The odor strength beyond this range shall be deemed as odor pollution, which requires protective measures.

Table 6-7 List of Classification of Odor Strength

Classification of Odor Strength	Olfactory Strength of Odor
0	Odorless
1	A little odor (threshold concentration detected)
2	Relatively weak odor of which the nature can be identified (threshold concentration confirmed)
3	Distinct odor that can be smelled easily
4	Distinct odor that can be smelled very easily
5	Extremely strong odor

② Analysis of odor impact

This assessment adopts analogy to analyze and identify the odor pollution strength class of the Project. Refer to the Mudanjiang Nanpaozi Dredging Project, and refer to table 6-8 for investigation and analysis of odor strength class of pollution source.

Table 6.2-8 Odor Strength of Sludge Dredging in Mudanjiang Nanpaozi Dredging Project

Distance	Olfactory Strength of Odor	Class
Bank	Distinct odor	Class 3
30 m from bank	Slight odor	Class 2
80 m from bank	Extremely slight odor	Class 1
More than 100 m from bank	No odor	Class 0

Nanpaozi lies in the southeast of Mudanjiang City and is the important pollution discharge and assimilation river channel in Mudanjiang. Due to the indiscriminately discharged domestic sewage, the water quality has been seriously degraded (water body inferior to Class V at present). The dry construction in Summer is adopted for this river channel. It can be seen from the results in table 6-8 that only slight odor exists at the distance of 30 m from the river channel during the dredging of Nanpaozi, and the odor strength is Class 2 around, which is a bit lower than the limit standard (Class 2.5 ~ Class 3.5) of the odor strength, and there is almost no odor at the distance of 50 m from the river channel. The Project is subject to cofferdam dredging. The range and degree of odor impact of sludge will be lower than them in Nanpaozi Dredging Project. Therefore, the range of impact of sludge stockpile is within 30 m in this Project. In this Project, the temporary stockpile for sludge completely lies within the range of red line of the construction site, and consideration has been given to that all distances between odor source and sensitive points around are more than 50 m.

6.2.3 Analysis of Impact on Surface Water Environment

(1) Construction sewage

The 4 components involved in the proposed project all suffer from the sewage arising from the drainage of foundation pit, mortar system and washing of equipment etc.

Cofferdam construction is adopted, so some sewage of foundation pit may arise from the construction. The drainage of foundation pit includes preliminary drainage and regular drainage. The preliminary drainage means the drainage of water accumulated in the foundation pit within the cofferdam, namely, the original river water plus seepage and rainwater, in which the SS content in water is relatively high (100 - 500 mg/L) and there are no other pollutants. The whole preliminary drainage works can be completed within 2 days since leakage stopping of cofferdam. In order to protect the water quality of river, the water drained shall not be discharged without sedimentation process. The regular drainage means the drainage for water accumulated in the foundation pit from rainwater, seepage and

construction water (dominated by concrete curing water) during excavation of structure and pouring of concrete, and is characterized by high SS content (in the concentration of 2,000 mg/L). The water can be treated for use on the construction site, and the water that cannot be utilized shall be treated up to the Class I standard specified in the *Integrated Wastewater Discharge Standard* (GB8978-1996) for discharge.

The sewage produced in the mortar system etc. is dominated by SS pollutant, with fine silt as ingredients, and shall be subject to treatment in a sedimentation tank to be built. The treated water can be recycled for the procedures subject to relatively low requirements of water quality. The sewage arising from washing of equipment is dominated by SS pollutant and supplemented by a few oil pollutants, and can be recycled through sedimentation for oil removal.

The construction sewage can hardly impact on the receiving water body on the premise of being appropriately treated.

(2) Surface runoff of rainwater

Since the Project is subject to linear engineering and a relatively large construction area, lots of runoff with SS on the construction site may come out due to disturbance of construction site and rainwater in rainy season, and may impact on the water quality of river to some extent in case of being directly discharged into the river body without treatment. Therefore, sedimentation tank needs to be built at the low-lying place within the construction site in the construction area, so that the surface runoff can all flow to the sedimentation tank for sedimentation and then for dustproof purpose in the construction area, which can hardly impact on environment.

(3) Impact of construction of water-related works on water environment

It is planned that the construction of water-related works of the Project shall be all carried out in dry season. Most of the engineering construction sections lie above the perennial water level. Besides, cofferdam construction process is adopted for water-related works during construction, thereby mitigating the impact of construction disturbance on water quality of river. The cofferdam construction sewage shall be treated to be recycled for use on construction site, and the sewage that cannot be utilized shall be treated up to the Class I standard specified in the *Integrated Wastewater Discharge Standard* (GB8978-1996) for discharge. With these measures taken, the impact of water-related works on water quality of relevant river will be small.

(4) Domestic sewage

All of the 4 components involved in the Project are free of construction encampments. The construction personnel shall need to rent the local residences, in which the domestic sewage and household garbage produced therefrom can be treated by the system of the local residences, and can therefore hardly impact on environment.

(6) Analysis of impact on alternative drinking water source of Fujiang River

All water intakes of Tongnan Water Plant lie on the Hanjiang River (artificial canal) at present. The Xiaoqiaowan water intake of Ancient Town Water Plant of Tongnan County is not used anymore, and water basin where this water intake lies is under the management only as alternative water source. In case of insufficiency of intake quantity of water from the canal for Tongnan Water Plant, use the alternative water intake. Division of protected areas of alternative drinking water sources is shown in table 6-9.

Table 6-9 Division of Protected Areas of Alternative Drinking Water Sources of Fujiang River

Name of Water Plant	Name of Water Source	Type of Water Source	Range of Water Basin of Class A Protection Zone	Range of Water Basin of Class B Protection Zone	Vertical Range in Land Area of Protected Area
Tongnan Water Company	Fujiang River	Secondary river	Water basin of the whole river width covering 1,000 m of upper reach and 100 m of lower reach	Water basin of the whole river width from 1,000 m to 1,600 m of upper reach and from 100 m to 200 m of lower reach	Vertical range of 30 m from river channel edge corresponding to normal water level in flood period



The main works of Dafuba embankment project and toe protection near the river do not lie in the water basin of protected area of alternative drinking water source, but about 250 m of tail of toe protection near the river at the K5+200 ~ K6+840 section lies in the land area of the Class A protection zone of the drinking water source, and 550 m of toe protection lies in the land area of the Class B protection zone of alternative drinking water source. According to Article 58 of the *Water Pollution Prevention and Control Law of the People's Republic of China*, the project unrelated to water supply facility and protection of water source is prohibited for new construction, reconstruction and expansion in Class A protection zone of drinking water source; and according to Article 59, the project subject to pollutant emission is prohibited for new construction, reconstruction and expansion in Class B protection zone of drinking water source. The toe protection near the river lies in the land area of Class A protection zone of drinking water source, which violates the regulations of the *Water Pollution Prevention and Control Law of the People's Republic of China*, so this must be corrected.

According to the "TNF [2013] No. 261 Document" issued by Tongnan County People's Government, it is agreed that the water intake of alternative water source of downtown of Tongnan County can be moved downstream for 300 m, namely, the new water intake will be located 300 m downstream of the current water intake. Environmental Protection Bureau of Tongnan County will reinforce the management of drinking water source and strictly implement relevant management systems about drinking water resource. Upon relocation of water intake, neither the Dafuba embankment project and nor the toe protection near the river lies in the Class A

protection zone of drinking water source.

The alternative water intake lies downstream of the Dafuba embankment project. The construction of water-related works will cause rise of SS concentration in the water body in some areas (2,000 mg/L). However, due to a good SS settleability caused by construction, water quality can be restored by settling in a near range. Therefore, the impact due to rise of SS concentration in water body caused by construction mainly focuses in the range around the construction area, and will disappear upon completion of the construction, so the engineering construction can hardly impact on the entire surface water environment. Besides, since this water intake is the alternative one and will be used only for the insufficiency of water supply from the major water intake for a relatively short duration, the construction will not cause any significant adverse impact on this water intake by improving the construction schedule and avoiding the operating period of this water intake.

Furthermore, household garbage etc. produced by construction personnel may enter into the alternative water source to cause pollution of water quality. So construction entities must reasonably arrange the construction site, reinforce the admonition and management of construction personnel and optimize the construction proposal. Treat and then comprehensively utilize the construction sewage without discharging it into Fujiang River. Strictly implement the soil and water conservation measures during construction, accomplish the hoarding works during construction and do not throw muck into river channel. Reinforce the management during construction, and prohibit construction personnel from discharging the household garbage into the river channel along the project route.

With the above-mentioned measures taken, the construction sewage will not impact on the water quality of alternative water source, and can hardly impact on the alternative water source of Fujiang River.

(7) Analysis of impact on water intake of Shangtang Water Plant

Based on investigation, water intake of Shangtang Water Plant in the scale of 300 m³/d lies at the origin of the Pengshui component (the 3539 Shoes Factory), and protected areas of drinking water source have not been divided for this water intake yet. Since the entire route of embankment works is subject to riprap, which may cause rise of SS concentration and impact on the water quality at the water intake to some extent, but the water intake lies upstream of the riprap range of the embankment works, the riprap can hardly impact on the water quality at water intake.

Since this water intake is in a relatively small scale, agreement has been made with Shangtang Water Plant that water intaking and riprapping shall be staggered in time, namely, construction entities shall inform the Shangtang Water Plant to conduct the

water intaking after the riprapping has been done around the water intake and the SS concentration goes back to the original level. Therefore, the underwater riprapping can hardly impact on the water quality at the water intake only if reinforcing the construction management and taking corresponding purification measures by the water plant according to the water quality conditions.

6.2.4 Analysis of Impact on Ecological Environment

6.2.4.1 Analysis of Impact on Terrestrial Ecology

(1) Analysis of impact on vegetation in land area

The project construction area is dominated by cultivated land, forest and grassland, flood land, water basin and construction land. Based on the field investigation and preliminary statistics provided by construction contractors, the vegetations involved in the project area are dominated by the endemic common vegetations, such as weed and crop etc., and there are no rare species or special endemic species. The construction will cause reduction of number of regional vegetations, and will not bring about significant adverse effects on biodiversity.

Upon completion and operation of the Project and implementation of vegetation compensation measures, the vegetation that has been damaged during construction will gradually recover, so there are no significant adverse effects on vegetation in land area during operation.

(2) Analysis of impact on animals in land area

Based on the investigations of current conditions of wild animals in assessed area, there are a lot of human activities around the project area. The animals living in the project area at present are dominated by rodents and supplemented by birds, and there are no rare, endangered animals and large wild animals under protection of China and Chongqing found in the assessed area.

Land acquisition for the Project, increase of number of construction personnel and frequent construction activities may disturb the birds for foraging, resting and multiplication. Since most of the birds are good at flying and relatively capable of avoiding dangers, generally they will fly away from the construction area to other areas around under the impact of construction activities. And since there are many appropriate areas around, the project construction will not significantly impact on the birds in the evaluated area for living and foraging.

The land acquisition during construction will relatively narrow down the habitat of terrestrial animals, and excavation works, activities in material yard, discharge of construction sewage and operation of construction machinery etc. will impact on the

ecological environment quality in the area and bring about adverse effects on animals such as some frog, snake and mouse etc. in the project-related area. Since these terrestrial animals are common species characterized by relatively good adaptability, a certain migratory ability and trend of diversification of food sources, most of them will actively move to appropriate area around under the impact of the project construction. Besides, since this Project is subject to a small area and personnel distributed in each construction area is in limited numbers, the project construction can hardly impact on the terrestrial animals.

Conventional animals living around the construction area may be impacted by the construction activities more or less. However, since most of these animals are capable of flying or avoiding dangers, and will generally actively move away from the construction area to the area around in a large area and with the similar ecological environment such as farmland and forest land etc. under the impact of the construction activities, on the whole, the construction activities will make these animals temporarily move away from the construction site to other areas with the similar ecological environment, and will not impact on the population and diversity of species of animals under protection. As a result, the construction activities will not cause the significant change of species and number of terrestrial animals, and will temporarily impact on them.

Upon completion and operation of the Project, the impact arising from construction will gradually disappear, some animals moving to the area around under the impact of construction activities may go back to the original habitat, and those incapable of going back to the original habitat can easily find appropriate habitat around to live on. The operation of the Project will not bring about significant adverse effects on animals in land area.

6.2.4.2 Analysis of Impact on Aquatic Ecology

Based on investigation of hydrological and hydraulic conditions at the place where the Project lies, hydropower stations in multiple cascades have been built in all basins of each river involved in the Project. The hydropower stations in upper and lower reaches of the area where the Project lies are shown in table 6-10.

Table 6-10 Hydropower Stations in Upper and Lower Reaches of the Area Where the Project Lies

Category	Component			
	Rongchang component	Shizhu component	Pengshui component	Tongnan component
Cascade hydropower station	The project river channel is between Shabu Hydropower Station and Gaoqiao Hydropower Station.	The project river channel is between Tengzigou Hydropower Station and Niulankou	The project river channel is between Pengshui Hydropower	The project river channel is between Wudu Reservoir and Fujinba navigation and - hydropower

		Hydropower Station.	Complex and Yinpan Hydropower Complex.	complex
--	--	---------------------	--	---------

Most of the ecological environments in each basin have been fragmented under the cut-off effects of hydropower stations in multiple cascades, and the original natural habitats have also changed a lot. It can be known from investigation that the Rongchang component and Shizhu component do not involve distribution of nationwide rare and endangered protection fish and Chongqing's key protection fish and migratory fish, and the natural spawning grounds, feeding grounds, winter grounds and migration channels of important aquatic organism; and the Tongnan component involves 2 spawning grounds of fish and 1 Chongqing's Class-II key protection species - the *procypris rabaudi*. The Wujiang River is subject to a seriously degraded water ecology and free of important natural habitats and rare fish under protection. However, there may be some spawning grounds for some ordinary fish, of which the specific locations have not been found out yet.

(1) Assessment of impact on water environment

① Analysis of impact on water quality

Construction period: the foundation excavation during construction of the Project will cause rise of SS concentration in the water body at the project river channel and will impact on the transparency and photosynthesis of the water body to some extent. During construction, the water quantity for aquatic food organisms in the water basin of the project river channel will drop to some extent. Domestic sewage shall be treated by existing facilities and construction sewage shall be deposited for recycling purpose and without being directly discharged, thereby avoiding any significant impact on water body and water quality.

Operation period: no significant impact on water quality since there will be no sewage discharge during operation due to the natures of flood control works.

② Analysis of substrate impacts

The Shizhu component involves the river dredging, which will completely damage the riverbed substrate at the river channel to be dredged. The riverbed substrate is the base for many kinds of benthos and periphyton to attach on and grow, and will be damaged by dredging works, which will cause reduction of population of benthos. However, since the river channel to be dredged is relatively short, the dredging works do not involve the spawning ground, feeding ground and winter ground of fish and the substrate will gradually recover after the dredging works, the dredging works of Shizhu component will hardly impact on the water ecology. Other components do not involve the dredging works, and the construction of dam will damage the substrate to a very limited extent.

③ Analysis of hydrological impact

The implementation of the Project will change the river channel depth and width of some areas, so some flood land on the banks will become dam. However, the construction purpose is to improve the flood control level of the project river channel, the change of flow velocity due to the Project mainly occurs on the project river channel, and the flow velocities and water levels of other sections are almost free of any changes.

(2) Assessment of impact on ecological system in water basin

① Fish

Construction period: the construction noise and SS etc. will cause avoidance of fish. Fish at the project river channel may migrate to other areas.

Operation period: the construction of dam will damage the flood land and vegetation distributed along the river banks and cause reduction of food organisms of fish and substrate for spawn to attach on, which will be unfavorable to growth of feeding of fish and growth of spawn for a long time. However, since the project river channel only accounts for a very low proportion of length of the river, and Shizhu component and Rongchang component do not involve rare fish, spawning ground, feeding ground and winter ground of fish and migration channel, the operation will hardly impact on the habitat of fish.

Analysis of key protection species involved in Tongnan component:

a Rare protection fish

According to the resource investigation conducted in 1970s (the *Jialing River Fishery Resources Investigation Report*) at the Fujiang River section, the nationwide rare protection fish such as acipenser dabryanus and mullet etc. had been found. There are no places for reproduction of this fish on Fujiang River, and this fish is temporary living fish flowing from the main stream of Yangtze River for food. Upon the construction of hydropower projects on Jialing River and Fujiang River, the migration channels for this fish have been cut off. This fish had not been found during several investigations since 2004 and there are no miss-catching records of rare fish.

b Endemic fish in upper reaches of Yangtze River

According to results of investigation conducted in 2004, there are 12 endemic species of fish in upper reaches of Yangtze River distributed at the Tongnan section of Fujiang River in total. Most of these species had moved out of this section by 2007

due to backwater arising from the Fujinba navigation and - hydropower complex, and only *procypris rabaudi* was found.

The above-mentioned fish had not been found in the resource investigation conducted at the Tongnan section of Fujiang River in 2009-2010. Based on the visit and investigation of fishermen, still there was some fish in this species caught by fishermen, but in a very low number.

According to the above-mentioned analysis, the impoundment of reservoir of Fujinba navigation and - hydropower complex in the lower reaches has reduced the flow velocity off Fujiang River reaches in downtown Tongnan; therefore, some endemic fish in upper reaches of Yangtze River subject to benthic living of torrent has moved out of the water basin due to change of hydrological conditions and division by hydraulic structures. Currently, there are still few species left, but belonging to individuals left, so this kind of fish resources is subject to a less optimistic future, and the implementation of the Project will not significantly adversely impact on the hydrological conditions at the project river channel of dam and substrate of the river.

c Endemic key protection fish and introductions thereof

Currently, *procypris rabaudi* has been found in the endemic key protection area at this river section.

Taxonomic status: *procypris rabaudi*, belonging to cypriniformes, cyprinidae, cyprininae and *procypris*, commonly known as Rock carp.

Morphological characteristics: flat and rhombic sides, back bulged to arc shape, and round abdomen; small and conical head, relatively sharp lip shorter than length between two eyes ends; sub-hypognathous part in U shape; thick lip with unobvious papillary bulges, no papillary bulges for small ones; 2 couples of barbel, the rear couple a bit longer than the front couple, eye diameters approximately in the same length; big eyes; flat and straight lateral line, with 43-45 scales; particularly strong dorsal and anal fin, with saw tooth on rear edge; flat and straight outer edge of dorsal fin, long substrate with 18-21 branch fin rays; beginning points of dorsal and pelvic fin opposite to each other; long pectoral fin, with end reaching the beginning point of pelvic fin; dark black or dark purple head and body back, with a little blue purple gloss, and silvery white abdomen; 1 black spot behind each scale; 1 black edge behind the tail fin; during reproductive period, each scale of milt in dark black, with spots at the head.

Living habits: most of *procypris rabaudi* lives at bottom of water body with relatively gentle water flow and many rocks at substrate, and often appears among rocks. The *procypris rabaudi* overwinters in grotto or deep bay in riverbed, and starts swimming up to any tributary for spawning at beginning of spring. The minimum

maturation age is 4 years old. The spawning period is February ~ April, preferably February ~ March. Based on the information provided by fishermen, there are also brood stocks activities for spawning in autumn (August ~ September). Generally the spawning ground is distributed in the water basin with tributary rapids and substrate of gravel. Spawn appears faint yellow and attaches on rocks to grow. *Procypris rabaudi* is subject to a relatively slow growth. Generally, the 4-year-old fish can reach about 0.5 kg in weight; the 10-year-old fish can reach 59 cm in length and 4 kg in weight; and the common individuals are 0.2-1.0 kg in weight, and the individual can reach 10.0 kg in weight at most according to records. Although *procypris rabaudi* belongs to omnivorous fish, but it prefers the benthonic animals, dominated by mollusks such as chironomid larvae, ephemeroptera and trichoptera larvae, oligochaeta, small periwinkle, corbiculidae and *limnoperna lacustris* etc., and supplemented by decaying higher plant debris and occasionally by a little phytoplankton and zooplankton. *Procypris rabaudi* has no ingestion in winter. The ingestion increases in March ~ April to peak in July ~ August.

Resources characteristics: *procypris rabaudi* is distributed in main stream and tributary in upper reaches of Yangtze River, with a relatively high economic value in the fishery in upper reaches of Yangtze River, is favored by people due to the advantages of small body cavity, tender meat and good taste etc. although the yield is low, and belongs to medium-sized superior economic fish.

In recent years, dam gate has been built on the tributary in upper reaches of Yangtze River, which cuts off the migration channel to spawning ground for *procypris rabaudi*. Besides, the *procypris rabaudi* resources have been damaged very seriously due to high-intensity fishing, in particular the large-scale electric fishing, and impacted by threatening factors such as degradation of water quality caused by sewage discharge of factories along the river etc., so this fish is subject to a relatively low growth, the population cannot be replenished in time and the wild populations are in a very low number.

② Plankton

Due to the drop of transparency of water body caused by riverbed substrate disturbance and water loss and soil erosion etc., some of the project river channel is subject to drop of populations of plankton during construction. This impact will gradually disappear since operation, and the populations of plankton will gradually recover.

③ Benthos

The embankment works of the Project are mainly located on bank slopes in high- and low-water drawdown area, with little benthos, so the Project can hardly impact on the benthos. The substrate will gradually become stable after construction,

and the benthos will gradually recover in several years. Therefore, this impact is reversible.

The dredging works of Shizhu component will change and completely damage the riverbed substrate at the river channel to be dredged, and completely change the current ecological environment of substrate at the river channel. The original benthos will all disappear. However, based on the investigation, the river channel involved in the Shizhu component does not involve the distribution of nationwide rare and endangered protection fish, Chongqing's key protection fish and migratory fish, and the natural spawning grounds, feeding grounds, winter grounds and migration channels of important aquatic organisms, or large scale fish farms, and the substrate of river bed will gradually recover; therefore, the dredging works can hardly impact on the water ecology.

(3) Assessment of impact on important ecological environment

The important ecological environment involved in the Project is "spawning ground, feeding ground and winter ground". Among the 4 components, the water ecology information and data of Binjiang section of Wujiang River in Pengshui County indicate that although the Wujiang River is subject to a seriously degraded water ecology and free of important natural habitats, there may still be some spawning grounds for ordinary fish, of which the specific locations have not been found out yet. Currently, only the Tongnan component involves this, so this report only provides the assessment of important ecological environment involved in the Tongnan component.

① Spawning grounds

Since the construction of embankment works is scheduled in dry season, there will be no water-related works, so there will be no disturbances on water body of Fujiang River and there will be no need for spawning ground for embankment works. The Huangjiaotang spawning ground lies about 200 m upstream of the embankment and will not be impacted by sewage discharge. The construction noise will impact on the spawning ground to a very limited extent.

Xibutang spawning ground lies on the Fujiang river channel in about 400 m on the east side of the embankment section II. The construction waste arising from the construction shall be treated up to standard for recycling purpose. Since the sewage will be appropriately treated instead of being directly discharged into Fujiang River, there will be no adverse effects on Xibutang spawning ground due to sewage discharge.

Since the construction period of the Project is 18 months, the Xibutang spawning ground and the Huangjiaotang spawning ground in the nearest distances to

the Project will be impacted by factors such as noise and water loss and soil erosion etc. arising from the foundation excavation of the Project, but to a relatively low extent since the distance from the construction site is relatively long and the Project will not lie within the range of protection of these two spawning grounds.

② Feeding ground

The feeding scale of fish at the river channel involved in the Project will be inhibited during construction under the impact of factors such as noise and water loss and soil erosion etc. arising from the foundation excavation of the Project, since the feeding grounds of fish in lower reaches of Fujiang River mainly focus on the banks of the Fujinba reservoir area. Although some of water basins at the river channels involved in the Project are suitable for feeding of fish in flood season, they are in a relatively small scale. Therefore, the Project can impact on the feeding of fish in lower reaches of the Fujiang River, but to a relatively low extent.

③ Winter ground

The river channels involved in the Project are subject to a relatively low water depth in dry season and originally have no environmental conditions of water basin for fish to overwinter. With the Fujinba reservoir built in the lower reaches, the winter grounds of fish in lower reaches of Fujiang River mainly focus on the river section in the Fujinba reservoir area, so the Project can hardly impact on the fish in Fujiang River for overwintering.

④ Migration channel

The river channels involved in the Project are free of large and medium migration channels for fish, and the Project will not bring about any cut-off effects.

6.2.5 Water Loss and Soil Erosion

6.2.5.1 Control of Water Loss and Soil Erosion

The control of water loss and soil erosion includes the project construction area and the directly affected area. The project construction area includes embankment area and temporary construction facility area. The directly affected area includes areas excluding land occupied by the project, which may suffer from water loss and soil erosion due to the effect of project construction.

Refer to table 6-11 for the control of water loss and soil erosion and its responsibility ranges based on field survey and statistic analysis of the project design data.

Table 6-11 Control of Water Loss and Soil Erosion and its Responsibility Ranges
unit: hm²

Component Name	Project Construction Area	Directly Affected Area	Total
Rongchang component	39.52	15.98	55.50
Shizhu component (No water conservation scheme)	34.61	8.94	43.55
Tongnan component	61.874	20.42	82.294
Pengshui component	32.54	13.49	46.03

6.2.5.2 Forecasting of Water Loss and Soil Erosion

According to the method of water loss and soil erosion forecasting, and in combination with the results from partitioning of forecasting units and forecasting intervals as well their relevant forecasting parameter values, the water loss and soil erosion from calculation that may be caused by the project construction is presented in table 6-12 in detail.

Table 6-12 Possible Water Loss and Soil Erosion

Component Name	Forecasting Interval	Disturbed Erosion Area (hm ²)	Forecast Loss (t)	New Loss (t)
Rongchang component	Construction period	39.52	5024	4493
	Natural restoration period	11.12	91	9
	Subtotal	50.64	5115	4502
Shizhu component	Construction period	34.61	7835	7111
	Natural restoration period	20.37	1177	496
	Subtotal	54.98	9012	7607
Tongnan component	Construction period	59.01	10830.65	10476.17
	Natural restoration period	17.67	742.49	384.22
	Subtotal	76.68	11573.14	10860.39
Pengshui component	Construction period	46.03	8071.6	5076.4
	Natural restoration period	27.46	1131.8	209.7
	Subtotal	73.49	9203.4	5286.1

6.2.6 Solid Waste

The solid waste produced during the construction period of project mainly includes discarded earth and rocks and domestic waste. As for Shizhu component, it

is even concerned with dredging sludge.

6.2.6.1 Analysis of Impact

(1) Rongchang component

① The earth and stone spoil includes 834,200 m³ of cut, 658,500 m³ of fill and 175,700 m³ of spoil. The cut spoil is temporarily stored in temporary stockpile at each construction site, in which some portion of spoil is used for embankment filling, while the rest, after being temporarily stored in temporary stockpile at the construction site, is finally transported to the Huangjinpo Public Dump Areas for stockpiling by means of vehicle carrying through the existing road in Rongchang. The dump areas are located in 2 depressions near High-speed Railway Station of Huangjinpo Management Committee, with a capacity of about 300,000 m³ and capable of accommodating the spoil produced by the component. The Management Committee has approved such accommodation. Refer to agreement in the attachment.

② Domestic waste and floaters: the domestic waste is mainly accumulated on Lukong Town Overflow Dam, Shabu Hydropower Station Overflow Dam and near Erlangtan Bridge, which will be removed by engineering measures. According to check calculation, totally 400 m³ of domestic waste and floaters from the river have been cleared this time. The floaters and domestic waste cleared from the river are temporarily stored in the temporary stockpile after being collected, and then are transported away by means of vehicles through the existing roads in Rongchang to Jiangjiagou Landfill for landfill disposal.

③ Domestic waste: about 191.9 t of output of domestic waste are produced by the constructors, which will be treated by the existing local facilities, for example, the domestic waste can be collected and transported by environmental sanitation authority.

(2) Shizhu component

① The earth and stone spoil includes totally 407,700 m³ (bank measure) of earth-rock cut, 243,800 m³ (bank measure) of earth-rock backfill and totally 219,000 m³ (loose measure) of spoil. The spoil is temporarily stored in temporary stockpile for each component for backfilling, and the rest is transported by means of vehicle through the existing road to Diaozui Dump Area in Shizhu County for disposal. The dump area is located in "Diaozui", a petty place downstream the river reaches of the project area. It covers an area of 38,000 m², with average slag-dumping height of about 8 m, slag-dumping capacity of 304,000 m³ and spoil transport distance of 13-17 km. It is accessible for all spoils produced by the component (refer to attachment for related agreement).

② Dredging sludge: cofferdam dredging is used by the component. There are about 74,000 t of sludge, with moisture content of about 80%. All of the dredging sludge, before being used as covering materials, will be subject to natural drying after being transported by tank trucks to Yaodianzi Waste Treatment Plant under the operation of Limin Waste Treatment Co., Ltd. in Shizhu County. This plant is located in Yaodianzi in Shizhu County, with a haul distance of spoil transport of 25-28 km, daily treatment capacity of 150 t, design service life of 11 years and coverage of 13,200 m². The moisture content of sludge should be less than 60% as required by the waste treatment plant. For the component, prior to landfill, the dredging sludge is treated by drying bed provided for the Yaodianzi Waste Treatment Plant so that it can reach the moisture content required by the waste treatment plant. Refer to attachment for agreement.

③ Domestic waste: about 100t of domestic waste are produced by the construction personnel, which will be treated by the existing local facilities, for example, the domestic waste can be collected and transported by environmental sanitation authority.

With the above-mentioned measures taken, the solid waste will have a minimum impact on environment.

(3) Tongnan component

① The earth and stone spoil includes 301,600 m³ of spoil. For the component, 3 dump areas are provided on the depression at embankment toe, with coverage of 7.28 m², 4.94 hm² and 8.15 hm² respectively, within 100 m from the construction site. The spoil produced by embankment cut is directly transported to the dump area without temporary stockpiling in the construction site. The extra earth and rocks produced by cutting are directly transported to 1#, 2# and 3# dump areas on the depression at embankment toe by loader and lorry, which have a minimum impact on environment.

② Domestic waste: about 225t of domestic waste are produced by the construction personnel, which will be treated by the existing local facilities, for example, the domestic waste can be collected and transported by environmental sanitation authority.

(4) Pengshui component

① The earth and stone spoil includes totally 371,200 m³ (bank measure) of earth and stone spoil. Due to high mountain and steep slopes and limited construction of villages and towns in the component area, two dump areas are provided for the component, in which dump area 1 is proposed to be about 750 m upstream the origin of the project and next to Shihuituo Backfill Material Borrow, with coverage of 19600 m², and capacity of 100,000 m³; dump area 2 is Shihuituo

Backfill Material Borrow which is also used as dump area upon completion of use as borrow, with coverage of 17,200 m², and capacity of 300,000 m³. Pengshui Urban Construction Investment Co., Ltd. has agreed such accommodation. Refer to attachment for agreement.

② Domestic waste: about 250t of domestic waste are produced by the construction personnel, which will be treated by the existing local facilities, for example, the domestic waste can be collected and transported by environmental sanitation authority.

With the above-mentioned measures taken, the solid waste will have a minimum impact on environment.

6.2.6.2 Rationality Analysis of Site Selection of Disposal Area

(1) Temporary stockpile

According to the component condition, the construction sites for the component are of area-based arrangement, in which the construction area includes: the production area, mainly arranged within the land occupied by the component; and the living area, mainly including residential houses rent. The temporary stockpile for construction is arranged close to the construction and production area, which is within the land occupied by the project.

With corresponding measures taken, the site selection of temporary stockpile for construction is rational, with a relatively lesser impact on surrounding environment.

(2) Dump Area

For the component using the existing dump area, no rationality analysis of site selection will be conducted as due diligence and accommodation feasibility analysis has been conducted earlier. Such analysis will be conducted only for the newly built dump area.

① Dump area for Tongnan component

For the component, 1#, 2# and 3# dump areas are located on depression after the construction of embankment, which can effectively prevent waterlogging, can fully utilize the cut earth and stone during the construction of dike and are rationally arranged nearby so as to reduce the transport links. Upon completion of construction, the land functions can be recovered by land reclamation, such that the impacts on agricultural production and the surrounding natural vegetation are relatively lesser. Therefore, the site selection of dump areas is rational according to the evaluation.

② 1# dump area for Pengshui component

The site is about 750 m upstream the origin of the component and close to Shihuituo Backfill Material Borrow, with coverage of 19,600 m² and capacity of 10,000 m³. It is close to the construction site of the component and is rationally arranged nearby to reduce the transport links. Upon completion of construction, the land functions can be recovered by land reclamation. In addition, there is no environmental sensitive sites around the site. Therefore, the site selection of dump areas is rational according to the evaluation.

6.2.7 Social Impact

6.2.7.1 Analysis of Impact on Local Land Resources

The land acquisition required for the construction of the project mainly affects permanent and temporary land occupation and existing land within the project. In combination with the overall local planning, the land for the project is regarded as urban construction land. Upon completion of the project, the original farmland and uncultivated land are transformed into land for urban infrastructure, such as land for flood control and urban greening. The project construction complies with requirements of regional land use planning. The land temporarily occupied for the construction accounts for a small proportion of the project land and includes temporary stockpile, temporary road and land for temporary facilities. Meanwhile, as such land is restored upon completion of the construction; the impact on land resources is relatively small, and almost insignificant on regional land use pattern.

6.2.7.2 Impact on Regional Traffic at Construction Site

As many construction vehicles will get in and out of the construction site during the construction period, major impacts are on transport, road pavement, crossover roads and traveling inconvenience. For the project, the use of existing transport system for transporting construction materials will bring certain pressure on traffic nearby. The construction of the project will have a minimum impact on urban traffic after the following measures are taken to strengthen traffic management: persons are designated to direct the traffic at the inlet and the outlet of the construction site; vehicle transport must follow the management regulations of urban road transport; overload is prohibited; vehicles must be carefully washed before running on roads in the urban area; vehicles with tires carrying mud is prohibited to run on roads.

6.2.7.3 Impact of Traffic Blocking and Jam on Local Residents and Schools

During the construction period, the increased traffic flow, site excavation, particularly excavation for sewage pipes to be laid along the road and the residential areas, will cause inconvenience to daily traveling at sensitive sites like residential

areas and schools, and may bring adverse impacts on the business and income of the affected merchants. However, as the construction duration of the project is not long, these impacts are limited within a short period and will disappear upon completion of the construction.

6.2.7.4 Impact of Construction on Social Economy

The construction of the project will promote the social and economic development of the construction area, for example, a large amount of such construction materials as cement and aggregate required for the project construction will promote the development of local industries like building, transport, etc.

6.3 Impact on Environment during Operation

6.3.1 Surface Water

Upon completion of Rongchang, Shizhu, Tongnan and Pengshui components, the pollution on local surface water will not be aggravated since no sewage and wastewater is produced by the project itself. On the contrary, the implementation of the project can reduce the local water pollution by collecting and delivering the sewage discharged in a scattered manner to the sewage plant, and hence facilitating the improvement in quality of local water environment.

6.3.2 Acoustic Environment

According to the analysis, upon completion, the impacts of the project on acoustic environment mainly include noise from sewage lifting pump stations and traffic noise from roads along the embankment.

(1) Noise from pump station

Two sewage lifting pump stations are involved in Rongchang and Shizhu components, with noise source intensity of 80 db generally. After the proposed noise reduction measures and noise reduction level are taken into consideration, the level of noise source is about 55 dB(A).

According to the formula recommended in the *Technical Guidelines for Noise Impact Assessment - Acoustic Environment* HJ2.4-2009, the calculation formula is as follows:

$$L_p(r) = L_p(r_0) - (A_{div} + A_{atm} + A_{bar} + A_{gr} + A_{misc})$$

Where: $L_A(r)$ - A-weighted sound level at a distance of r from the noise source, dB;

$L_A(r_0)$ - A-weighted noise level at reference position r_0 , dB;

A_{div} - attenuation of A-weighted noise level caused by geometrical spreading of sound wave, dB;

$$A_{div} = 20 \lg(r/r_0)$$

A_{bar} - attenuation of A-weighted noise level caused by obstruction, dB;

A_{atm} - attenuation of A-weighted noise level caused by air absorption, dB;

A_{gr} - attenuation of octave frequency band caused by ground effect, dB;

A_{bar} - attenuation of octave frequency band caused by noise barrier, dB;

A_{misc} - attenuation of octave frequency band caused by other effects in multiple aspects, dB.

According to the investigation, no sensitive sites are found around the pump station of Rongchang component, so only sensitive sites involved in the pump station of Shizhu component are forecast in this evaluation.

Table 6-13 Impact of Noise from Lifting Pump on Sensitive Sites (Unit: dB (A))

Name of Pump Station	Noise Source Intensity	Noise after Sound Insulation	Sensitive Site	Distance	Forecast Contribution Value	Noise after Superposition with Current Value	
						Day	Night
Reconstructed pump station of Shizhu component	80	55	6 households with 16 people	10m	49.0	Day	55.9
						Night	49.8
New pump station of Shizhu component	80	55	3 households with 8 people	15m	45.5	Day	55.4
						Night	47.1

According to the forecasting, with corresponding measures taken, like provision of special pump house, installation of damping cushions for water pumps, and use of soft joints for all joints, the acoustic environment at sensitive sites can meet Class II standard of *Environmental Quality Standards for Noise* (GB3096-2008), and there is no change on the functions of local acoustic environment.

(2) Traffic noise of dike road

The function of dike road involved in the project is embodied in landscaping, flood control and rescue, while the traffic noise has a minimum impact on quality of the surrounding acoustic environment due to fewer vehicles.

6.3.3 Ecology

Four components involved in the project are all about nature of environment treatment, that are implemented for better protection of environment and improvement of local ecological environment. Therefore, the implementation of the project can promote sound development of ecological environment.

Table 6-14 Impact on Ecological Environment during Operation

Component Name	Analysis of Ecological Impact
Rongchang component	<p>No problem about “three grounds” (spawning ground, feeding ground and winter ground) is involved within the component evaluation.</p> <p>With relatively minor working face, and strong adaptability of aquatic organism to the change of water environment, upon completion of construction, the ecological system of the reaches within the construction area can recover by itself. Therefore, the operation of the component will have a slight impact on local water ecology.</p>
Shizhu component	<p>No problem about “three grounds” (spawning ground, feeding ground and winter ground) is involved within the component evaluation.</p> <p>No protected rare terrestrial animal or plant is found within the component affected area. Prior to implementation of the component, the terrestrial ecological system in the evaluated area mainly consists of weeds, bushes and some crops distributed along both banks of reaches of the component, which will slightly affected by the implementation.</p> <p>The impact of river channel dredging by excavation on aquatic organism is temporary. After the treatment, the water will become clear and habitats of aquatic organism will be gradually recovered and improved.</p>
Tongnan component	<p>With relatively minor working face of embankment works, and strong adaptability of aquatic organism to the change of water environment, upon completion of construction, the ecological system of the reaches within the construction area can recover by itself. Therefore, the operation of the project will have no impact on local fish resources. Meanwhile, as embankment works occupies no spawning ground, it will have a slight impact on hydrologic regime of the upper reaches, with a small change in water level. The operation of this works will have no impact on spawning ground.</p>
Pengshui component	<p>A certain change in landform and substrate of riverbed within the construction area along left bank of Wujiang River, caused by the component, will result in sediment loss and various changes in flow field and food organism basis of local reaches, so that the local inhabitation ecological environment of aquatic animals may be affected temporarily. As both construction range and change in ecological environment are limited, when fish in this water area adapts to new environment, the regional organism composition, even regional ecological system structure, will recover.</p>

6.3.4 Landscape

For the project, based on characteristics of landscape environment around the

river reaches to be treated. the engineering measures harmonious with the surrounding landscape like bank-type slope protection is taken. The landscape is designed to form an open, waterfront and participatory landscape space, to reveal the concept of “people first” and to emphasize “harmony between man and nature”.

The greening design is unfolded on a basis of points and lines. Several petty scenic spots consisting of plants are provided in each entrance, which are integrated by green road network and scenery. The plants are planted according to their heights, with the mixing of the deciduous with the evergreen and innocuous plants with eye-pleasing form greening the landscape nodes. The nursery stocks should be selected to fit growth in the local area and be simply conservable in future, without introduction of alien species.

Therefore, with the completion and operation of embankment works, the construction of waterscape and ecological environment along the bank will moves along, forming an urban green belt, which promote the construction of an artificial urban ecological system and create a 3D urban ecological environment, where the utilization value of land on both banks will be rapidly increased and the supporting embankment crest greening works and slope surface greening works will provide people with agreeable entertainment space and green ecological space, and be built in water platforms and landscaping corridors, which have such functions as recreation, leisure, culture and entertainment, realizing the harmonious development between man and nature.

6.3.4.1 Analysis of Impact on Dingming Mountain–Canal Scenic Spot

(1) Positional relation between this component and Dingming Mountain–Canal Scenic Spot

Dafuba Embankment (K1+780 ~ K6+037) is located in the canal scenic region within Dingming Mountain–Canal Scenic Spot, only occupying Class C protection zone (landscape and restoration zone and development controlled zone); K6+484 ~ K6+840 is located in region of Dafu (Giant Buddha) Temple, occupying Class B protection zone (sightseeing zone) and not occupying Class A protection zone (protection zone of historical site or relics); the embankment is not within the range of core scenic spot of Giant Buddha Temple.

Dafuba Embankment section I (K0+000 ~ K1+780) and section II (K6+037 ~ K6+484) are not within planning range of the scenic spot, occupying areas of 21.67 hm² and 8.67 hm² respectively; revetment section (K1+800 ~ K3-600) and embankment section II (K3+600 ~ K6+037), occupying a total area of 31.66 hm², is located in the canal scenic spot but outside core scenic spot, no key scenic spots within; embankment section II (K6+484 ~ K6+840), occupying an area of 1.52 hm², is located within the range of Dafu Temple, ends at northwest side of the temple.

Table 6-15 Positional Relation Between the Component and Dingming Mountain–Canal Scenic Spot

S/N	Stake No.	Scenic Spot Involved	Administrative Division	Positional Relation with Scenic Spot	Area Occupied hm ²	Degree of Impact
1	K0+000~K1+780	None	Xinsheng Village	Outside scenic spot range	21.67	A little
2	K1+800~K3+600	Canal scenic spot	Xinsheng Village and Qianjin Village	Ordinary scenic spot through canal scenic spot	31.66	To some extent
3	K3+600~K6+037		Qianjin Village and Shengli Village			To some extent
4	K6+037~K6+484	None	Shengli Village	Outside Scenic spot range	7.424	A little
5	K6+484~K6+840	Dafu (Giant Buddha) Temple scenic spot	Shengli Village	Ordinary scenic spot within Giant Buddha Temple scenic spot	1.12	To some extent

(2) Analysis of impact

① Impact on land resources

Permanent occupation of scenic spot is 32.78 hm², 1.02% of the whole area (32.1 km²), only involving ordinary scenic spot in the area except for core scenic spot of Giant Buddha Temple, which has very slight impact.

With strong reparability of artificial vegetation, lost biomass could be restored through construction of ecological embankment; certain ratio of impact on plant biological environment along the line by construction could be mitigated. Particularly, embankment cannot be constructed away from the bank of Fujiang River. Principles for embankment line arrangement include meeting safety requirements of flood release and discharge, reducing land occupation as much as possible, mitigating impact on environment as much as possible, enlarging flood prevention range as much as possible, combining flood prevention with drainage and combining flood prevention & drainage facilities with urban construction & development. Line selection for the Project is considered with less occupation of croplands and farmlands, which has minor impact on land resources in total.

② Impact on landscape

Revetment section (K1+800 ~ K3+600) and embankment section II (K3+600 ~ K6+037) pass through canal scenic spot in linear forms along the Fujiang River Embankment. Areas passed through are dominated by agricultural ecosystem, with crops planted by farmers as a major landscape along both sides of embankment. No

tourist route, scenic spots and groups of scenic spots are within the range of canal scenic spot passed by the embankment.

Embankment section II (K6+484 ~ K6+840) is located at the border of Buddha scenic spot and at north side of Shengli Weir. Line of this section is arranged along the planning line of scenic spot, closing to the border of scenic spot as much as possible. It not only protects a large area of land and house properties in Group One of Shengli Village, but also avoids destroying landscape within by separating contiguous scenic spots due to embankment construction. The project avoids the core scenic spot, but has a certain impact on the scenic spot of Giant Buddha Temple such as noise, vibration, raise dust and unfavorable landscape; however, the core scenic spot is at 500 m away from the Project, thus the impact is within an acceptable range.

6.3.4.2 Impact on Fujiang National Wetland Park

(1) Positional Relation with Fujiang National Wetland Park

Dafuba embankment (K6+270 ~ K6+840) is located within rational utilization zone of Chongqing Fujiang National Wetland Park (Class B protection zone) and also within scenic planning Giant Buddha Temple; other areas are not within planning range of wetland park.

(2) Impact on Fujiang National Wetland Park

① Impact on wetland resources

The total planning area of wetland park is 1450 hm², 368.7 hm² as rational utilization zone; Dafuba embankment has less impact on wetland resources by occupying 3.58 hm² in the park, only taking up 0.247% of the total park area and 0.97% of the rational utilization zone, among which the area of wetland and tidal flat is 3.32 mu.

② Impact on wetland function

At the beginning of wetland park planning, scenic spot of Giant Buddha Temple was included. As Dafuba embankment is located within the rational utilization zone, some leisure activities such as water-based activities, sightseeing, exploration and farming (fishing, herding) entertainment are developed according to natural geographic conditions, natural resources and landscapes of the wetland park. Except the planned project, other constructions are prohibited within protective range; buildings within the range must be coordinated with surrounding environment and landscape, and controlled in terms of scale at the premise of rational layout. Turf and landscape vegetation are planted on the bank slopes of gentle embankment, which

should be coordinated with surrounding environment and landscape. Dafuba embankment project received planning permission, and the construction meets the requirements in Overall Urban Planning of Tongnan County, Flood Control Planning Urban Reaches in Tongnan County and Notice of Comments on Accelerating the Development of Tongnan County by Chongqing Municipal People's Government and in *Overall Planning for Chongqing Fujiang National Wetland Park (2010-2018)*.

The implementation of the component will not change the current water conservancy conditions and integrity of the wetland, so the impact on the wetland is minor.

③ Comments from relevant departments

Forestry Bureau of Tongnan County replied in TLH [2013] No.67 document: "In principle, the component construction within rational utilization zone of the wetland park is approved," and required that the design and construction should meet *Provisions on Administration of Wetland Protection* and *Administrative Rules of National Wetland Parks* and the protection of wetland resources within should be strengthened.

Fujiang River National Wetland Park is an artificial wetland construction project and does not belong to natural wetland conservation project. Construction under the Project is consistent with wetland development and the plan of the wetland park, the project construction will promote construction of the wetland park, therefore, the project construction will have little impact on Fujiang River National Wetland Park.

6.3.5 Flood Release

(1) Rongchang component

① Impact on water regime of river

There is only a slight change in river surface profile before and after treatment works. After the treatment works, the change of flood level of Laixi River is very little compared with that prior to the treatment, while embankment works has less impact on water regime of river.

② Impact on flood release safety

Upon completion of embankment for this component, enough flood release width is reserved for Laixi River, which is 67 m~176 m (once in 20-year flood). The construction of embankment basically has no impact on flood release safety, as it can ensure enough flood release section for the river, so as to facilitate the flood release and keep riverbed stable.

(2) Shizhu component

The implementation of the component can promote the building of flood control capacity and improve flood control emergency mechanism.

The flood exceeding design standard should be controlled by such measures as early warning, prevention, dredging and management.

XL0+000.000~XL0+850.214 at left bank of lower reaches is a 850.214 m long build-up embankment; XL0+850.214~XL0+978.419 is 128.205 m long branch gully of Niushiqian River; XL1+097.761~XL1+419.457 is a 321.696 m long build-up embankment, where the Shizhu Sewage collection and treatment Plant is located; XL1+419.457~XL1+475.736 is the housing section, where a 56.279 m long embankment is built; XL1+475.736~XL1+481.763 is 6.027 m long, with bridges and culverts built; XL1+481.763~afterwards is the section of Shizhu Knitting Mill, where an embankment is built.

The design of embankment built considers the peak clipping effect of operation mode of Tengzigou Reservoir on flood (P=5.0%) at that time, while the design and calculation are conducted based on *Flood Regulation Scheme of Tengzigou Hydropower Station (2012)* under this working condition. According to *Flood Regulation Scheme of Tengzigou Hydropower Station (2012)*, Tengzigou Reservoir has no peak clipping effect on flood (P=33.3% and below).

This new embankment at right bank can lead to a lower flood level on each section compared with that under natural condition. For this component, as Tengzigou Reservoir has no peak clipping effect on flood (P=33.3% and below), resulting from change in its new operation mode, such that the design peak discharge is increased compared with the embankment built, this is why the water level calculated based on *Flood Regulation Scheme of Tengzigou Hydropower Station (2012)* is higher than embankment built.

Although some sections of the embankment built cannot meet the flood control standard (20-year flood), they are still higher than static water level of floods (P=10%). According to the analysis based on the wave run-up and free board, the floods are characterized with small length and limited harms. For this section, it is planned to take engineering measures such as dredging and non-engineering measures such as coordination of the relations between human being and floods and mitigation of flood impact to ensure flood release safety, so that this section can meet 20-year flood standard.

In conclusion, with limited impact on flood level and flow velocity, the component has a relatively lesser impact on flood control.

According to Flood Control Law of The People's Republic of China, upon completion of the component, barriers which may obstruct the flood release and traffic for flood-fighting and emergency rescues within the reaches are strictly forbidden. Flood control road is designed on the side of embankment, which can ensure smooth transport of materials for flood-fighting and emergency rescues during the emergency flood control period.

The completion of the component will lead to widened river channel, too large discharge capacity, improved water logging control capacity, satisfactory flood and water logging control capacity, stable bank slopes, which can help the flood control and rescue.

The component mainly focuses on slope protection treatment, without changing river direction. By bank-type slope protection works, the river channel is provided with scour prevention measures, so that it is subject to little eroding and stable in regime.

(3) Tongnan component

As this component mainly focuses on embankment works, no river per se is involved. There is only a slight change in river surface profile before and after treatment works. After the treatment works, the change of flood level of Fujiang River is very little compared with that prior to the treatment, while embankment works has less impact on water regime of river.

Flood discharge at Fujiang River section in the county town area of Tongnan County is mainly controlled by the cross-section (F10-1) about 1.3 km upstream of Lianhua Bridge, and the width of that section is only about 280m. The current flood discharge width of the river section is about 790m~1280m (one in 20 year flood). Since vegetable production base is located on the opposite bank, for which sloop protection instead of embankment is used for flood protection. Upon completion of embankment for this component, enough flood release width is reserved (695 m~1180 m, for one in 20-year flood). The construction of Dafuba embankment basically has no impact on flood release safety, as it can ensure enough flood release section for the river, so as to facilitate the flood release and keep riverbed stable

(4) Pengshui component

① Impact on water regime of river

There is only a slight change in river surface profile before and after treatment works. After the treatment works, the change of flood level of Wujiang River is very little compared with that prior to the treatment, while embankment works has less impact on water regime of river.

② Impact on flood release safety

Upon completion of embankment for this component, enough flood release width is reserved for Wujiang River, which is 67 m~176 m (once in 20-year flood). The construction of embankment basically has no impact on flood release safety, as it can ensure enough flood release section for the river, so as to facilitate the flood release and keep riverbed stable.

6.3.6 Social Impact

(1) Improvement of flood control system

The project mainly aims at flood control and protection of life safety and agricultural production of residents along the banks. 20-year flood design objective is adopted for each component. According to field study conducted by the project team, most of the floods seriously affecting the project area are 20-year floods, while the project can be constructed to basically meet the flood control demand of each component area. For the district/county of each component, the implementation of the project is an important step to improve the flood control system. For example, the implementation of Rongchang component, in combination with concurrent embankment projects built by World Bank and Asian Development Bank at earlier stage, further improves the flood control system in Rongchang County. While Shizhu component, linking with another embankment project completed by World Bank at earlier stage, further improves the local flood control system.

(2) Improvement of water environment and landscape

A series of engineering measures has been taken by each component to improve the water environment, among which the layout of sewage pipe network is the most important. For example, in Rongchang component, 13 km drainage pipeline provided with anchor block and maintenance shaft will be embedded, so as to introduce sewage at the embankment toe to sewage collection and treatment plant after being connected to the sewage pipe. In Shizhu component, 12.0 km sewage pipe will be newly built, with rainwater pipe works 2.4 km long.

For landscape, humanized engineering measures are considered in each component to improve the spatial arrangement along the banks, so as to facilitate the local residents without affecting their living habits. For example, “water” steps are designed in Rongchang component to facilitate residents’ washing and swimming, and large-scale bamboo forests along banks within Darongzhai Community will be kept whenever possible by the Designer during the design. Similarly, to facilitate the traveling and provide recreation site, Shizhu component employs the design of more than 10 km long leisure footpath. In Pengshui, with great importance to the landscape, the Planner adopts independent design of greening-based cultural

landscape works.

(3) Meeting urban planning requirements for the future

During the coordinative urban-rural development, Chongqing has proposed a four-level coordinative urban-rural area platform system based on the strategy of “One-hour Economic Circle and Two Wings”. According to the planning of Chongqing Municipal People’s Government, the blueprint of their own new town is planned in combination with their actual conditions such as social and economic development level, geographical conditions and customs. In the four districts/counties involved in this project, the flood control infrastructure required for the new town construction is gradually constructed by means of World Bank Loan. For example, Pengshui component is located in Shangtang and Xujiaba. This district is the long-term development planning area of Dianshui New Town in Pengshui County, which will be constructed as logistics center in Pengshui County in the future.

(4) Improvement of infrastructure in small town to lay foundation for the future social and economic development

According to the overall economic development of Chongqing, the project area still lags behind in economic development due to incomplete infrastructure which is one of the main restricts. Especially for these districts/counties, they have their own advantages for social and economic development, such as pigs in Rongchang County called as “China's National Treasure”, Tongnan County called as “Western Green Vegetable Base”, Shizhu County called as “Coptis chinensis Land”, and several tourism resources in Pengshui County. The river water will be purified by improvement of flood control capacity and water environment so as to create a fresh and pleasant environment which is suitable for the surrounding residents’ entertainment and will also attract enterprise investment. This will certainly bring more opportunities for the local social and economic development.

(5) Protection of local residents’ life and property safety and improvement of their income level

The integrated improvement project of water environment in small town can be implemented to improve the flood control capacity along the banks, to effectively protect the local residents’ life and property safety, to effectively protect the economic activities and agricultural production along the banks and to improve the local residents’ income level. For example, in Tongnan County, one of the main vegetable bases is located along the bank of Tongnan component, with vegetable cultivation as the main income source for the local residents. However, the seasonal flood will basically inundate a certain number of farmland each year, resulting in some economic loss. In addition, some employment opportunities provided during the construction and operation of the project can also, to some extent, contribute to the improvement of people’s income level in the project area.

(6) Indirect impact of new regional development

Along with the gradual implementation of urban development plan, a large amount of population will live and work in the development area, which will increase environmental pressure of this area. For example, the increased population will lead to a large amount of domestic sewage, domestic waste and other pollutants, and demand on traffic facilities and services. The project includes sewage intercepting pipelines and sewage collection and treatment plants, which can meet the local demand on sewage facilities. Meanwhile, for the project, training plan of public environmental consciousness is also developed for solving weak environmental consciousness of local people; concurrent construction of urban road is also being undertaken, which can accelerate the pace of regional development and can contribute to the regional development.

(7) Benefits to project-affected area

Among the four districts/counties of this project, Tongnan, the municipal-level poor county in Chongqing, and Rongchang are located in the western half of "one-hour economic circle", which have been in rapid economic development in recent years; as minority autonomous counties, Shizhu County and Pengshui County are located in remote rural areas in the southeast of Chongqing, both of which are national-level poverty-stricken counties, with relatively slow economic development. Most of the project areas are located in national-level or municipal-level poverty-stricken counties, this is why the poverty incidence of the project areas is slightly higher the national rural poverty level. This project can be implemented to effectively improve the local socially and economically backward conditions, with the impact mainly embodied in:

1) Improvement of local flood control capacity; protection of farmland, production facilities and residents' houses along the banks; and reduction of production and living loss caused by floods;

2) Provision of several technical and non-technical employment opportunities during the construction of the project;

3) Improvement of some residents' traveling conditions in the project-affected areas by new embankment crest roads in all the components, so as to create traffic conditions convenient for the rural poverty population to work in city;

4) Improvement of environment in the project-affected areas, even change in tourist facilities in some project-affected areas by flood control greening works and landscape works, which can provide startup and employment opportunities for the development of service industries such as tourism, farming entertainment, accommodation and catering in suburbs.

Based on original flood control system, this project, by improvement of local area's flood control capacity, improves the flood control system of the whole small

town, ensures normal implementation of economic and social activities in these areas, and promotes the sustainable development of the small town as well as the social and economic development of the whole indirectly affected area.

(8) Impact of change in land nature

The project-affected areas have been planned as land for urban construction. Along with the construction of the project, the infrastructures in the areas are gradually improved, and the land planning in the project-affected areas will be gradually put into force. As a consequence, the land use value will be improved and the regional urbanization development can be promoted. Meanwhile, along with the urbanization development, the migration of a large amount of population to the area will lead to an increase in demand of regional traffic, supporting environmental protection facilities and other infrastructure. Incomplete supporting infrastructure will have a significantly adverse impact on regional environment.

(9) Impact on ethnic minorities in project-affected areas

1) Distribution of ethnic minorities in Chongqing

Among all municipalities directly under the central government in China, Chongqing is the only one that has ethnic minority autonomous areas. It has minority autonomous areas and a big amount of ethnic minority population living scattered. Currently, Chongqing administers 4 autonomous counties, 1 district that enjoys preferential policies for ethnic autonomous areas and 14 minority townships. Total population of ethnic minorities was 1.9736 million in 2010 (based on the fifth population census), including 1.4243 million of Tujia people, 502.4 thousand of Miao people, and 11.5 thousand of Hui and other peoples that have Muslim dietary habit, accounting for 6.4% of the total population of the municipality. Altogether, there are 54 ethnic minorities in Chongqing (lacking Ozbek nationality).

Population and the distribution of ethnic minorities living together as same minority group in Southeastern Chongqing: Southeast Chongqing has ethnic minorities living in compact communities, including 4 ethnic minority autonomous counties (Shizhu Tujia autonomous county, Pengshui Miao autonomous county, Youyang Tujia-Miao autonomous county and Xiushan Tujia-Miao autonomous county) and 1 district that enjoys preferential policies for ethnic autonomous areas (Qianjiang District). It covers 17 thousand km², accounting for 20.6% of the total area of the municipality. In 2008, it had a total population of 3.18 million (taking up 9.7% of the municipal total), including permanent residents of 2.4692 million (taking up 8.68% of the municipal total); its agricultural population totaled 1.881 million, of which Tujia and Miao peoples amounted to 1.837 million, accounting for 93.1% of the total ethnic minority population of Chongqing.

Population and distribution of ethnic minorities that live scattered or mixed with other nationalities: About 140 thousand ethnic minorities in Chongqing are living scattered or mixed with other nationalities in all counties and districts in the

municipality. In the municipality there are 14 ethnic minority townships in total, including 10 Tujia townships(Henghe, Dibao townships in Wanzhou District; Qingshui township in Yunyang County; Yunwu, Longqiao, Changan, Taihe townships in Fengjie County); 3 Miao-Tujia townships (Wenfu, Shiqiao and Houping townships in Wulong county); and 1 Gelao township (Haokou township in Wulong county), covering a total area of 1202.3 km² and with a total population of about 160 thousand, of which ethnic minority population is about 62.7 thousand, accounting for 39.2% of the total population of the townships.

Additionally, ever since Chongqing became a municipality directly under the jurisdiction of the central government, it has seen a rapid growth of ethnic minority population in the main urban area. Now in the main urban area of the municipality ethnic minority population is close to 70 thousand, and permanent residents of ethnic minorities total 61 thousand (including 31 thousand ethnic minority students in the colleges and universities), floating population of ethnic minorities total over 7,000.

2) Situation of Ethnic Minorities in the Project Area

Included in the Project, Shizhu and Pengshui components involve ethnic minorities.

① Population and distribution

In Shizhu and Pengshui counties, ethnic minorities are mainly living mixed with the other nationalities but concentrated in smaller areas, such distribution is because of a complexity of reasons. For instance, after “Bureaucratization of Native Officers” in 1735, Han people moved successively into Tujia people inhabited areas, and Tujia people gradually learned and began to use Han language, and they called themselves “Tujia”, Han people “Kejia”, Miao people “Miaojia”. The name of “Tujia” nationality was officially taken in 1957. After 1980s, growth of Tujia population appeared very fast. For instance, Tujia population in Shizhu County was 227,800 in 1985 and reached 272,356 in 1990. Besides, under the “family planning policy” ethnic minorities are allowed to have 2 children, therefore, Tujia population has maintained a stable increase. Table 6-15 gives some details of statistics of ethnic minority population in the project areas.

Table 6-15 Distribution of Ethnic Minority Population in the Project Areas

Areas	Total Population	Miao Nationality		Tujia Nationality		
		Population	%	Population	%	
Shizhu Component	Shizhu County	546900	58500	3.2%	404400	73.95%
	Nanbin Town	148542	267	0.18%	103563	69.72%
	Shuangqing Community	3420	23	0.75%	2166	70.55%
	Hongchunling	635	-	-	592	93.23%
	Loufangwan	928	-	-	843	90.84%
	Longjing Community	8212	6	0.17%	2512	69.30%
	Xuejing Group	396	-	-	346	87.37%

	Hongxing Village	5414	13	0.57%	2811	69.75%
	Hongguang Group	698	-	-	602	86.25%
	Chengnan Community	4580	6	0.29%	1437	70.12%
	Zhongba Group	821	-	-	740	90.13%
Pengshui Component	Pengshui County	690800	310800	45%	103600	15%
	Shaoqing Street	52000	18500	35%	13000	25%
	Lingjiang Community	4900	784	16%	147	3%
	Group 1	976	246	25.20%	68	6.97%
	Group 7	333	30	9.01%	35	10.51%
	Group 8	376	24	6.38%	61	16.22%
	Group 9	482	23	4.77%	11	2.28%
	Group10	438	26	5.94%	30	6.85%

Data Source: 2011 Statistical Year Books of Shizhu and Pengshui counties and governmental websites.

② Religion and Culture

Tujia and Miao religious and folk beliefs are now presenting diverse and complex situation, they believe in both traditional folk beliefs and Buddhism and Taoism. For example, ethnic minorities in Shizhu County have beliefs of nature worship and animism faith, but generally speaking, these folk beliefs gradually become marginalized in their daily lives and are playing less and less influence. In terms of language, many Tujia and Miao people have generally learned Chinese, those with schooling experience can read and write, and they use Chinese language for literary creation.

In interviewing relevant departments, such situation was also confirmed. For example, during interviews in Shizhu county, according to Mr. Liu, director of Tujia Culture Research Institute, some Tujia national customs and language are still existing in Shizhu, but they have been weakened or rarely used. In Pengshui interviews, the officer from the local minority and religion committee introduced that currently the local minorities have neither distinct customs or beliefs of their own, nor own language or characters, and that they are living together with Han in same neighborhood and intermarriage to Han people is common.

③ Ethnic Minority Policies and Plans

The national and local governments have formulated a number of preferential policies and provided more convenience for production and life of the minorities to promote their development.

At the central government level: First, financial support. The central government allocates every year 5 million yuan to each provincial government and 4.5 million yuan to each municipal government as ethnic minority development fund. Secondly, preferential policies for production of special commodities to meet ethnic minorities' requirements, and for trade of ethnic minority regions. Thirdly, preferential policy to ethnic minorities for college entrance examination, i.e. additional scores (from 5 to 20 scores) granted to them. At present, this policy is meant mainly for regions inhabited

mainly by an ethnic minority as an ethnic group. Last, the family planning policy. In order to ensure stable growth of population of minorities, the minorities are exempted to some extent from the family planning policy and basically can 2 children, and for the ethnic minority with a smaller total population, there is no limit to its birth quota.

At Chongqing municipal government level: First, counterpart supporting mechanism. Ever since 2007, Chongqing municipality has been implementing “One Circle and Two Wings” counterpart supporting mechanism, under which, the districts located within the one hour economic circle of Chongqing (including Yubei District, Jiangjing District, Hechuan District, Yongchuan District) are assisting Youyang Tujia-Miao autonomous county, Shizhu Tujia autonomous county, Pengshui Miao autonomous county and Qianjiang District, respectively; and Dazu District (merger of Dazu County and Shuangqiao District) and Bishan County jointly aid Xiushan Tujia-Miao autonomous county. Secondly, employment enlargement. During the 11th Five Year Period, Chongqing adopted preferential policies on technical talent team building, civil service recruitment, position setting in public institutions, allowance approval of Southeast Chongqing ethnic minority areas, this promoted human resources development in the minority areas. For example, 20% of admission ratio was required to be given to ethnic minorities in 2011 civil service examination process in Qianjiang, Youyang, Xiushan, Shizhu and Pengshui counties/district. Thirdly, policy on college entrance examination. In order to promote balanced development of national education and entire municipal education and break through the bottleneck of ethnic education development in Southeast Chongqing, Chongqing implements preferential policies to ethnic minority students by allowing 10 score reduction for their admission threshold (for art, sport categories, 5 score reduction is applied). In addition, under the same conditions, priority is given to admission of minority students. Finally, ethnic minority fund projects with Chongqing characteristics. In order to help the poor minority students to complete their studies, from the beginning of 2010, Chongqing has been implementing a “Minority Youth Growth Project” and providing fund to poor minority students recruited by colleges and universities with 3000 yuan per year per student. Moreover, in the two project counties, local policies to support ethnic minorities according to local actual situation are also formulated. For instance, in Pengshui County, the county government provides preferential one-year loan with an interest lower by 2.88% than the benchmark interest to ethnic trade enterprises producing production and daily life commodities for ethnic minorities as identified by the Ethnic and Religion Committee of the county. It should be noted that, because Shizhu and Pengshui counties are ethnic minority autonomous counties, within which Han population is relatively smaller, or the actual minor group of nationality living in there. Therefore, the two counties do not need to formulate specific ethnic minority policies or, if put in another way, their policies are all benefiting ethnic minorities within their autonomous areas.

At the same time, for the purpose to promote ethnic work, governments at all levels in Chongqing have formulated plans relating to nationalities' development in the 12th Five Year Period. For example, in 2012, the State Council promulgated the "Regional Development and Poverty Alleviation Problem Tackling Plan for Wulin Mountainous Areas (2011-2020), aiming at supporting local minorities' development; In 2012, Shizhu county government issued "Work Program of Shizhu Tujia Autonomous County for Implementing Preferential Policies to Support Ethnic Trade and Ethnic Special Commodity Production Enterprises"; in the same year, Pengshui County government formulated "Scheme of Pengshui Autonomous County for Establishing Demonstration County for Ethnic Unity and Progress". It is also certain that in their 12th Five Year Plans, governments at all levels all have explicitly defined their specific policies to earnestly support ethnic development by providing relevant preferential support to the ethnic minorities.

④ Historical evolution and integration of ethnic minorities

In Shizhu and Pengshui counties, ethnic minorities are mainly living mixed with the other nationalities but concentrated in smaller areas, such distribution is because of a complexity of reasons. In Shizhu County, the main ethnic minority is Tujia, while in Pengshui, Miao. The historical evolution and integration of ethnic minorities involved in the project dated back to the period of "Bureaucratization of Native Officers" in 1735, when Han people began to move successively into Tujia people inhabited areas, and Tujia people called themselves "Tujia", Han people "Kejia", Miao people "Miaoja". In 1956, Tujia people were recognized as individual ethnic minority people. After founding of the People's Republic of China, the central government began to recognize ethnic minorities for implementation of ethnic policies of the established socialist county. Up to 1983, totally 53 ethnic minorities were confirmed, and it was in that same year Shizhu and Pengshui established their autonomous counties, respectively. In the ethnic validation process, central government established an Ethnic Minorities Identification Group to recognize ethnic groups based on relevant standards. Among them, as introduced by Mr. Liu, the section chief of Tujia Cultural Research Institute, the Tujia nationality in Shizhu County was confirmed mainly based on the chieftain system, genealogy research and etc. In Pengshui County, same methods of confirmation were used.

Integration of ethnic minority and Han nationality includes mainly intra-regional integration and inter-regional integration. Specifically, first, there are frequent intra-regional integration and exchanges along with ethnic people gradually flowing into county town and its nearby towns and their gradual acceptance of Han living habits and culture. Secondly, level of inter-regional integration is unprecedented. Migrant ethnic workers from Shizhu and Pengshui have been increasing in recent years, and the young rural workers mainly go to Shanghai, Guangzhou and Shenzhen to work. For instance, in the village interview held in Pengshui county, Mr.Zhang, the head of Lingjiang Village told the interviewers that many ethnic people in his

community went working outside.

During the interviews, the task team noticed that the ethnic minority families sampled and interviewed were not with district ethnic characteristics. For instance, the ethnic people in the project areas don't have ethnic minority characteristics, they can not speak Tujia language, don't have special clothing and own festivals. Some ethnic minority residents don't know why they were classified as ethnic minority. They have no idea about who is ethnic minority, who is Han in the village. Only the household register in the town keeps records of their ethnic status. For example, during an interview in Shizhu county, one Tujia resident interviewee said: "We Tujia don't have many own customs or habits". In this regard, the task team went to the local Ethnic and Religion Commission for in-depth exchange and was told by Mr. Liu of Shizhu County that, local farmers did not have deep understanding of the definition of ethnic minority and they only knew that they could benefit if with a ethnic minority status. Mr. Ran, a teacher in Pengshui county also said that, on the one hand, recognition of ethnic minorities in the old days was really a process "dipping too far to reach the furthest family root"; on the hand, because Miao people were seriously illtreated in the past history, especially during the period of "Driving away the Miao People and Expanding Land", making some returned and moved-in Miao people unwilling to admit their ethnic status. As time passes, their Chinesization is becoming more and more apparent.

3) OP 4.20 Not Triggered by the Project

In accordance with definitions in OP4.20 of the World Bank, the task team believes the Project does not trigger the OP 4.20 even with Tujia and Miao peoples in the project areas.

① Tujia and Miao in the project areas do not meet the definition of "sticking to ancestral territory and natural resources", since occupational choices of Tujia and Miao are diversified and it is very common for them to go out working as migrant workers or pass through college entrance examination and then stay working and living elsewhere.

② Tujia and Miao peoples don't meet the definition of "self-deeming and deemed by others as a special cultural group". In the project area, Tujia and Miao people are living together in harmony with Han people, they also seem indifferent towards ethnic consciousness. During interviews in Shizhu County, it was noticed that local ethnic minorities were not clear about who and which nationality.

③ They do not conform with the definition of "having own language that is usually different from the official language". Historically, their fusion with Han started very early. After "Bureaucratization of Native Officers" in 1735, Han people moved successively, and Tujia people gradually learned and began to use Han language. For instance, during interviews in Pengshui, it was noticed that local ethnic minorities

don't have ethnic minority characteristics, they can not speak Tujia language, don't have special clothing and own festivals. In interviews in Shizhu county, according to introduction by officer of local ethnic and religion commission, local ethnic minorities maintain some of their own language, but without their own characters, and they use Chinese language and characters in their daily communications.

④ They do not accord with the definition of "having traditional social and political organization and conducting production activities mainly for the self-sufficiency". In the project areas, Han and Tujia are at the same development level, Tujia people don't have traditional social and political organization. Regardless of being Han, Tujia, or Miao as ethnic status, the reasons of local people's poverty are nothing more than local environmental constraints (remoteness, high mountain block and infertile farm land) and natural calamities and man-made misfortunes (physical disability, illness and etc.), all local people have similar situation in term of economic development.

4) Inclusion of Features of Ethnic Minorities in Project Design and Implementation

Although the Project does not trigger OP4.20 of the World Bank, efforts should be made to incorporate some customs and habits of the ethnic minorities in project design and implementation periods.

① Construction of housing buildings. For example, customs and habits of ethnic minorities for constructing new housing buildings should be considered. The task team deems it necessary to pay attention to the following aspects: firstly, site selection of the housing buildings should not only conform with local governmental plans, but also take into consideration of habits of Tujia people in selecting site for the building; secondly, timing of house construction commencement should avoid death days of Tujia people, for instance, the five fifth days of the ten Heavenly Stems should be avoided for commencement of house construction for Tujia people; finally, ethnic minorities all have architectural styles and colors they continue to use for generations, therefore, project owner should consider this in house building design. For example, roof of the house can be designed as stilted building style, and outer walls of the house buildings can use black and white colors for painting.

② Ethnic logo design. For example, in Shizhu county, construction should include some logos of ethnic features to cater to psychological characteristics of the local ethnic minorities. First, totem worship needs can be met in project design. Since white tiger is enshrined by Tujia people, the designer can include tiger pattern in the construction projects. For instance, white tiger totem can be carved on the fencing bars or placed as sculpture in place people gather together. Second, liking of specific graphic patterns of the ethnic people can be considered in project design. The Tujia people have subconscious preference for symmetry and balance of things, they like triangle, square and straight line patterns and so on more than others. These preferences can be satisfied by special designs for fencing bars and buildings. Finally, color preference of ethnic people. Tujia people like black and white colors, so some public facilities and markings such as toilet, chair and dustbin can use these colors.

③ Consideration on special holidays of ethnic people. The project owner has committed to absorb some local people in participate in project construction, so as to increase their non-agricultural income. So, during project construction, in addition to national holidays, the project owner must consider special holidays of the ethnic minority, such as Gannian, Buffalo Festival and Daughters' Day and etc. of Tujia people.

(10) Poverty Analysis and the Alleviation Strategy

1) Poverty Status

Generally speaking, rural areas in Chongqing are weak in terms of economic development foundation and have widespread and big poverty stricken population. Out of the 40 counties and districts, 33 have poverty alleviation tasks to fulfill, accounting for 82.5% of the total number of counties and districts of the municipality. Totally, there are 18 key counties for poverty alleviation and development, accounting for 45% of the total number of counties and districts of the municipality, including 14 national level key counties and 4 municipal level key counties for poverty reduction and development. Additionally, distribution of the poor is relatively concentrated, mainly in Northeast Chongqing areas (Daba Mountain Areas) centered around Wanzhou District and Southeast Chongqing Areas (Wuling Mountain Areas) centered around Qianjiang District.

Among the 4 project counties, 3 are poverty stricken, including Tongnan as a municipal level poverty stricken county and Shizhu and Pengshui as national level poverty stricken counties. According to data of the sixth population census, urban and rural incidences of poverty in Shizhu and Pengshui counties are both higher than the national average. Table 6-16 shows the details.

Table 6-16 Poverty Status of the Project Counties

County	Urban		Rural	
	Poverty Population (10 ⁴ persons)	Poverty Incidence (%)	Poverty Population (10 ⁴ persons)	Poverty Incidence (%)
Rongchang	0.95	3.2	1.4	3.8
Tongnan	1.16	4.5	3.7	9.7
Shizhu	1.14	7.8	7.5	19
Pengshui	1.15	7.9	9.4	23.8

Data Source: The sixth population census.

During field surveys, the social assessment task team went to project villages for interviews to understand details of status of poverty groups, including their income sources, daily life and assistance received and so on. It was understood that the poor groups are mainly people in families with low income, the disabled or female head,

or the aged without a family. Table 6-17 gives the details.

Table 6-17 Details of Poor Families in Areas Directly Affected by the Project

County	Street /Town	Village /Community	Village Group	Name	Age	No.of People in Family	Causes of Poverty		
Rongchang	Lukong	Darongzhai	3	Liu Xiuwen	60	3	Female headed		
				Liu Rukun	65	3	Female headed		
				Bai Chengpang	31	3	Single parent		
		Yuding	8	Cao Lijiang	78	5	Disabled		
				Zhu Dingyin	46	4	Disabled		
				Tang Taiju	76	5	Female headed		
	Changzhou	Baochengsi	1	Yang Shengqiu	64	2	Elderly without a family		
				Liu Huifu	61	2	Elderly without a family		
				Xia Zhizhen	69	1	Female headed, elderly without a family		
Tongnan	Zitong	Shengli	2	Mo Shangxiu	64	1	Elderly without a family		
				Jian Xiaoqin	37	1	Female headed		
				Song Muying	46	4	Serious disease		
		Qianjin	4	Yuan Tanhua	52	5	Low income		
				Li Wenfeng	64	3	Low income		
		Pengshui	Shaoqing	Linjiang	1	He Lianglun	70	1	Elderly without children
Dong Changquan	35					3	Disabled		
Xiang Dengqian	8					Xiang Dengqian	72	5	Low income
						Zhang Wenqing	78	1	Elderly without children
Zhang Kechang	9					Zhang Kechang	60	4	Low income
						Dong Shifang	31	4	Female headed
Zhang Zetian	10					Zhang Zetian	78	4	Low income
						Zhang Zeqian	70	3	Low income

Note: No poverty groups are involved in Shizhu component since it is located in county town where the project affected people are relatively rich.

2) Poverty Alleviation Projects in the Project Areas

According to results of interviews with the Civil Affairs Bureaus, Poverty Alleviation Offices and related street committees and communities, the main reasons of poverty of residents in the project areas are: falling into or returning to poverty because of sickness, without male laborer in the family or the laborer becomes disabled, heavy schooling burden, family headed by female, family members all without a job, and etc. To address problems of the poor groups, except for subsistence allowances and social aiding system, Chongqing municipality has also implemented some poverty

alleviation projects, such as “Spring Breeze Project”, “Rain and Dew Action” and mini-loans for women and etc. At the same time, the counties and districts also have established poverty alleviation systems based on local poverty features, customs and habits.

① Rongchang Component

To solve problems of the poor in production and living, relevant departments in Rongchang County have provided a variety of employment policies, including working skillfulness training, employment aid and etc. For working skillfulness training, there are Rongchang Century Vocational Training School, Rongchang Vocational Education Center, Yuxi Vocational Skillfulness Training Center, Rongchang Disabled Vocational Training School and other designated training units in Rongchang county. The training topics include computer training, graphic design training, accounting computerization training, maintenance electrician training, chef training, housekeeping training, SYB entrepreneurship training and micro-enterprise entrepreneurial training and others. All these training programs are free to the poor participants. Rongchang governmental departments also attach importance to employment assistance, every year they will make some employment plans for this purpose, for instance, “Venture in Rongchang” loans to small enterprises, “Qingfeng Plan” for the young to start a business and etc.

② Tongnan Component

To solve problems of the poor in production and living, relevant departments in Tongna County have organized a variety of employment activities for employment training and assistance. For working skillfulness training, there are 9 designated training school, namely, Employment Training Center, Enwei Vocational Middle School, Angong Vocational Middle School, Aihua Computer School, Yucai Computer School, Jinlong School, Kepu School, Yuanrong Vocational Middle School and Hope Chef School. The categories of training include employment training, re-employment training, SYB training and micro-entrepreneurship training, surplus rural laborer transfer training, on-job migrant workers’ skillfulness upgrading training, pre-job training to migrant workers and etc. These training programs are free to the poor participants. Tongnan government also has provided a lot of employment aids to the poor, for instance, “Employment Aid Month” initiated by the county is targeted at the people in their 40s or 50s and able and willing to work, as well as households with difficulties of employment; and “Migrant Workers’ Day” aims at organizing employment fairs with jobs suitable to the migrant workers. Additionally, Tongnan county is committed to creating a “Western China Green Vegetable Capital” to provide relevant support to agricultural production. For instance, in 2012, the county Finance Bureau invested 1 million yuan to support farmer entrepreneurship training, biogas engineering training, marine sailors’ training, rural cooperative leadership training, and training and knowledge dissemination on rural tourism, rural information, pesticide marketing, agro-machine utilization and maintenance, feed processing, vegetable processing, and fruit processing and etc.

③ Shizhu Component

To solve problems of the poor in production and living, Shizhu county has actively organized its related departments, such as county Association of the Disabled, Human Resources and Social Security Bureau, Poverty Alleviation Bureau, Agricultural Committee and etc., to provide diversified employment training and assistance to the poor. For working skillfulness training, in Shizhu County there are Shizhu County Vocational Education and Training Center, Shizhu County Working Skillfulness Training Center and Employment Training Center, Baike Professional and Technical Training School, Youth Vocational Skillfulness Training School, Shizhu County No.1 Vocational School. The categories of training include employment training, re-employment training, micro-entrepreneurship training, surplus rural laborer transfer training, on-job migrant workers' skillfulness upgrading training, pre-job training to migrant workers and etc. These training programs are free to the poor participants. Based on local circumstances, in providing employment aids, Shizhu county government has conducted such activities as "Public Benefit Post Development" to provide posts to the poor in environmental sanitation, public health and education departments, and "Providing Training in Enterprises to Upgrade Workers' Skillfulness" targeted at workers in the industrial zones and etc.

④ Pengshui Component

To solve problems of the poor in production and living, the Employment Bureau of Pengshui County takes the lead, with cooperation of other governmental departments, in establishing a completed assistance system with local ethnic characteristics. For working skillfulness training, in Pengshui County there are 6 designated training schools, namely, Employment Training Center, Vocational Education Center, Yucai Vocational and Technical School, Hengyuan Vocational and Technical Training School, Xinhai Vocational and Technical Training School, Rongyu Vocational and Technical Training School. The training is categorized as SYB training and free of charge skillfulness training and etc. These training programs are free or subsidized by county government to the poor participants. As employment assistance, the Employment Bureau provides services to employment and business start-up and organizes a variety of programs such as "Employment and Entrepreneurship Platform", "Employment Fair Specially for Private Enterprises", "Return-to-Home Migrant Workers' Employment Fair" and etc. Because the mountainous topographic features of Pengshui County are suitable for animal husbandry development, the county Animal Husbandry Bureau has established a relatively complete supporting system for animal husbandry development, including support to pig raising, beef cattle raising, goat raising, bee raising and etc.

3) Needs of the Poor Groups

In the process of field surveys, discussion meetings and interviews were conducted to have in-depth understanding needs of the poor groups towards the Project and impacts of the Project on them. The poor groups in the project areas indicated that, on the one hand, along with social and economic development and governments'

implementation of poverty alleviation policies, their life has improved; on the other hand, they still face some difficulties in life such as without a stable job, lack of laborers in the family and higher medical care expense and etc. Meanwhile, they expressed their warm welcome for construction of flood control projects, stating that such projects would better protect their production and living from losses due to flood disasters and reduce their financial burden for coping with the flood disasters. Especially for those poor families, most of their income comes from agricultural production, and the grain and vegetable products from their farm land are also important to them as self-sufficient products, the currently undefended conditions of the rivers in the project areas make them more likely to suffer the flood damages.

At project preparation stage, the social assessment task team conducted discussions and interviews to publicized project information and understand needs and suggestions of the stakeholders, especially the poor groups. The task team found needs of the local poor groups being about the same throughout the 4 project counties. Results of the interviews are analyzed by the task team and summarized as follows.

- (1) At project implementation stage, some non-technical jobs can be provided to the abled laborers in the poor families, so as to help them to increase income.
- (2) The project can be used as an opportunity to help change the one-time compensation to long-term income source to the poor by providing employment training and job opportunities to them, instead of only providing endowment insurance. Local job opportunities are preferable, since most of these people are not willing to go working outside.
- (3) Particular attention should be paid to education of children from poor families, so that future of those children won't be constrained by their family circumstances.
- (4) Construction of flood control projects will improve surrounding environment and lay a good foundation to local tourism development, as well as providing some employment opportunities to the poor groups, such as jobs in tourism industry (working as cleaning workers, temporary jobs and etc.).

4) Poverty Reduction Effects of the Project

- ① Promoting employment of local residents, especially the poor, and helping their income increase

Construction of the 4 project components will create temporary and permanent jobs. According to estimation, construction of roads will mainly rely on mechanical and technical workers, but during civil construction period, more non-technical jobs will be created cumulatively. Through communications with project owners and implementing entities, measures will be taken to ensure priority to the poor, women and other disadvantaged groups in the project areas in employing non-technical workers during construction period.

According to results of field surveys, the Project can provide more employment opportunities to local residents and help increasing their income. Due to differences in social and economic status, the 4 project components are characterized by various features as follows: a) Rongchang Component. In Lukong Town, construction of embankment will not only reduce losses caused by floods, but also help to beautify environment and provide better infrastructure for local tourism development; b) Tongnan Component. In Dafuba area, local residents are planting vegetables in large area, and the good natural environment there is promising for agricultural tourism development. However, frequent floods deprive the area of the opportunity. The project implementation can effectively reduce flood damages and upgrade local people's income from vegetable production, as well as providing good conditions for development of "Happy Farmhouse Inn" tourism in the local area; c) Shizhu Component. Since the project is located in Nanbin Town, the county town and will support construction of several kilometer long green shade avenue as a place for rest of the surrounding residents, especially their after dinner walks. As a result, business opportunities, such as small vendor stalls, tea selling, minority performances and etc., can be created for the local people; d) Pengshui Component. Flood control facilities to be supported by the Project in Linjiang community, the important area for planned future development of the county seat, are the priority to the county as per its urban development plan. Therefore, the project implementation will help to provide good infrastructure to local development and better conditions for local poverty reduction and prosperity.

② Promoting industrial and tourism development and providing conditions for improvement of living and employment environment for the local residents, especially the poor group

Through communications with project implementing entities, use of local building materials for project construction will be given priority under the prerequisites of proper tendering and bidding process and meeting quality standards. Therefore, project implementation will stimulate development of local building material (including cement) enterprises in the surrounding area of the project and benefit construction of and investment in local infrastructure, thus increasing employment opportunities for the local residents and creating conditions for overall shaking-off poverty of the local area. In addition, under the premise of guaranteed quality, priority can also be given to local plant nurseries in procuring seedlings needed for road greening under the Project, and this will also help to increase incomes of relevant local enterprises.

The project can help to promote tourism development in some project areas, e.g. Rongchang and Pengshui, and is favorable to overall shaking-off poverty of the local area. In Pengshui, tourism has been taken as the key industry by the county based on its ethnic and geographical features. Tourism development will bring revenues to the county and increase employment. Besides, job threshold of tourism industry is relatively low and the local people can have the jobs after simple training.

(11) Gender Analysis

1) Status of Women in the Project Area

① Overview of Status of Women in Chongqing

Based on data of the sixth population census in 2010, permanent population in Chongqing was 28.8462 million in total, including women of 14.2503 million, accounting for 49.40%. For the project counties, permanent population totaled 669.7 thousand for Rongchang County, including women of 406.7 thousand, accounting for 48.7% of the total registered population of the county; permanent population totaled 640 thousand in Tongan, including women of 440.7 thousand, accounting for 47.12% of the total registered population; Shizhu County had a total permanent population of 415.1 thousand, including women of 260.6 thousand, accounting for 48.29% of the total permanent population, urban population of 134.2 thousand, accounting for 24.87% of the total permanent population; Pengshui County had a total permanent population of 540.6 thousand, including women of 317.5 thousand, accounting for 46.31% of the total registered population.

In terms of employment, according to the report Investigation on Employment Status of Urban and Rural Residents in Chongqing issued by Chongqing Academy of Social Sciences in February 2013, women employment ratio in Chongqing is generally declining, and the primary reason for women in rural and urban areas of Chongqing choose to stay nonemployed is their choosing to stay at home doing housework. Based on data of the report, 68.5% of the nonemployed women are because of housekeeping, while 65.8% of urban nonemployed women are due to housekeeping. Although staying at home for housework results in wage income of women fall behind that of the male, other income of women in Chongqing is higher than that of the male. As the investigation unveils that, for incomes from house, land, vehicle rentals and other property incomes (from stock, bond, fund and interest), the income ratio of male to female in Chongqing is less than 1, with the lowest being only 0.47, which, from one aspect, reflects that women in Chongqing enjoy higher family status.

② Women in Areas Directly Impacted by the Project

Questionnaires and interviews targeted at women in the project directly affected areas were included in the field surveys for the purpose of understanding their development status. During social and economic investigations, number of women interviewed in Rongchang, Tongnan, Shizhu and Pengshui project areas is 202, 303, 62 and 175, respectively, accounting for 49%, 48%, 47% and 47% of the total number of people sampled in the respective counties. Also it was noticed by the investigation group that women in the surveyed areas had achieved great improvement of their production and living capability, and were earning a major part of income for their families. For instance, during village level questionnaire investigation in Tongnan, head of Shengli Village told the investigation group that, "Incomes of women are about half of the total household incomes in many families in our place, while in some families, incomes of women are higher than that of the male. This is mainly because

women are more hardworking and better at arranging things in the process of agricultural production”.

2) Women Development Projects in the Project Counties

On one hand, facilitating benefits to women from the project depends on attention to needs of women and issues relating to them in all periods of the project; on the other hand, it also relies on some on-going women development programs and activities in the project areas. Through discussions and interviews with the county Women’s Federations in the project area, the social development consultants learned some details of on-going women development programs and activities in the project and summarized as follows:

Firstly, women’s microfinance program. In Chongqing, this program is being organized by the municipal Women’s Federation, and implemented by Women’s Federations in the counties and districts as the main implementing bodies. It targets at local women’s self-employment, partnerships or small labor-intensive enterprises established by organizing women as employees. Urban and rural women may apply for the micro-loans to local Women’s Federations on a voluntary basis.

Secondly, labor skillfulness training program. In the project counties, the Women’s Federations all organize skillfulness training to help women to get employed, so as to upgrade their employment ratio and increase their income. Examples of such training include housekeeping training, maternity matron training, women entrepreneurship training and etc.

Finally, programs with local characteristics. Based on local circumstance, some women federations in the project counties has implemented programs with local characteristics. For instance, “Women in Poverty Alleviation” competition program in Rongchang county guides and promotes rural women to participate in trainings on planting, animal raising and agricultural processing skillfulness, so as to help rural women to shake off poverty and proceed towards well-off while helping government in re-employing laid-off women workers. Women’s Federation in Tongnan county integrates resources from departments of human resources and social security, agriculture, forestry, science and technology to support various trainings to women by means of joint sponsorship and sole sponsorship arrangements with relevant departments. The trainings are to encourage potential women entrepreneurs to change business concept and upgrade entrepreneurial ability, and to guide them in selecting suitable businesses. Women’s Federation in Shizhu County organizes a “Return-to-Home Female Migrant Workers’ Forum” to widely publicize employment information and policy of the county industrial zone and mobilize more previously outbound migrant workers to return home working. Women’s Federation in Pengshui County tried and obtained financial support from county Finance Bureau and established 20 Left-behind Children’s Homes in the rural areas, it also obtained a fund of 800 thousand yuan from Spring Bud Dream Coming True Action and helped 200 poor girls to realize their dreams of studying in university. It is also organizing training for transfer of rural laborers with cooperation of the county agricultural

school.

3) Analysis of Needs of Women

At project preparation stage, the social and economic investigation group conducted discussions, interviews and other activities to publicize information on the proposed project constructions, and to understand needs and suggestions of the women in the project areas. Needs of the women for the proposed project were identified through the field surveys and are summarized as follows.

① Need to know about the project. From the questionnaires and interviews, it is understood that the majority of women are supportive to the project constructions, they deem them public welfare constructions, especially flood control construction that will promote local development. However, during field surveys, the group also found that women's understanding about the project is relatively limited, most of them just "heard about the project". Additionally, many women indicated their higher attention to openness, transparency and timeliness of project compensations. From these, it is clear that women in the project areas have the need to further understand the project.

② Need of improved flood control facilities. The group found during the field surveys many women engaged in production activities, and they indicated great impact of flood disaster on their agricultural production, including big reduction in agro-income. Being good at managing family budget, women know better the losses caused by flood, and thus are eager to upgrade protection against river flood.

③ Need of getting employment opportunity. Project implementation will need some non-technical workers. Regarding this, women interviewed expressed their higher willingness to get employment opportunities under the project compared to males interviewed, and rural women's such willingness seemed significantly higher than that of the urban women. The reason for this is that it is much easier for urban women to find a job in the secondary or tertiary sectors and close to their homes, while it is impossible for rural women to go far from home working or to have permanent jobs outside of their hometown, since they are assuming much more housework. The construction sites of the project are closer to their residences, and the working hours are relatively flexible, therefore, rural women interviewed expressed their hope of getting a job under the project.

④ Need of improved road. During field survey to one village, the social assessment group found women in Pengshui particularly concerned about road improvement in their village, due to the fact that the outbound road is rugged, narrow with uneven surface, making it difficult for villagers to go out, especially for the kids to go to school.

⑤ Need of upgraded flood control embankment safety. The social assessment group found in field surveys that, many women's more important work was taking care of their children in addition to agro-production and other productions. A considerable

part of women thought that children might like to go playing, climbing and chasing on the embankment because of lack of safety awareness. Hence, the women indicated their hope of upgrading safety system of the embankment to lower probability of accidents.

⑥ Need of washing and drawing-water platforms. In Rongchang and Pengshui, women would like to go washing clothes by the river and fetching water from the river during water shortage time intervals, so they hope that the Project will include some platforms to facilitate their washing and drawing-water activities.

4) The Project's Function in Promoting Women's Development

According to focal group discussions, in-depth interviews and key informant interviews with relevant departments, construction of the project will enable women to benefit from the project; But if the project design, implementation, operation and management lack ample consideration of gender sensitivity, the project will have the potential risks of reducing benefits to women from the project or even excluding women from benefiting from the project. Therefore, it is necessary to focus on needs of women from the following aspects, so as to promote project benefits to women, minimize the abovementioned risks, and thus achieve the objective of promoting women's development through the project implementation.

① Focusing on the needs of women in project design and thereby improving project design

As shown by results of socio-economic surveys, relative to men, women pay more attention to details of design of flood control facilities, especially in terms of possible impacts of design on their families and children. Construction in the past years tended to pay mere attention to engineering effects and adopted a neutral point of view in the design, as a result, some special needs of women were neglected. Therefore, ample attention should be paid to needs of women at the design stage of the Project, so as to facilitate project benefits to women. Specifically, efforts should be made to: a) fully use power of women in governmental departments and agencies at all levels to ensure more project information sharing among women. Meanwhile, by using this information sharing mechanism, ideas, suggestions complaints and other feedback of women can be transmitted to relevant departments; b) set up some benches and seats on the embankment roads to facilitate the elderly, women, children and other vulnerable groups; c) set up warning signs, guardrails and etc. to protect against potential risks of the embankment.

② Promoting participation of women in all project periods to upgrade their social status

Overall speaking, level of education of women has increased in the project areas, but "Breadwinning Men and Homemaking Women" concept still exists in varying degrees and affects women's public participation capability. During field surveys, it was noticed that some interviewees (including women themselves) tended to believe

that women were not competent enough to participate in decision-making on major issues in the families or on public affairs. But in reality, the majority of women are not only conducting agricultural and other production activities, but also undertaking a lot of housework, they are the direct beneficiaries of flood control facilities. Therefore, ample attention should be paid to ensuring adequate participation of women at preparation, design, implementation and operation and management stages of the Project by conducting public consultation and information dissemination activities in the time and manner suitable to women, so that women can bring up their own ideas, needs and suggestions regarding the Project. Additionally, in the process of preparing and implementing Resettlement Action Plan, full consultation with women should be conducted on issues including site selection, distribution of compensations, income recovery program and etc.

Therefore, the task team proposes to ensure women's participation in public consultation at various stages of the Project, and the proportion of women participants should be no less than 40% for the meetings of public consultation. In conducting project information dissemination, training and public consultation activities, special features of women for participating social activities should be taken into account, for instance, timing of such activities should avoid coinciding with their busy hours of housework and meeting venues should be arranged close to community/village, because most women can not be too far or too long away from home. Video and text messages should be used in combination in disseminating information to women to avoid difficulties of some illiterate women to get information. At the same time, in the process of distributing compensations for resettlement and land acquisition, measures should be taken to ensure women, as members of their families, understand the impacts on their families and compensations distributed, and validity of women's signatures on compensation distribution books should be acknowledged.

③ Providing non-agricultural employment opportunities to women and thus increasing women's income

During construction period, the Project will produce a large number of temporary or permanent non-technical jobs. In order to improve women's income, project owners and contractors should consider assigning some jobs to women. Additionally, in counties and districts with tourism resources, more job opportunities in service sector should be given to women. For example, Tongnan component is close to Dafu (Giant Buddha) Temple resort, where women can be offered with the opportunity to set up stalls selling incense sticks and other prayer stuff, so that their income can be increased. Since every year Women's Federations in the counties and districts will organize training on housekeeping and maternity matron service and etc., and the training covers topics such as cooking, home environment and health care and etc., local women can participate in such training to upgrade their skillfulness, so that they can start own businesses or work in tourism sector to increase their income.

The task team hereby suggests that, project implementation organizations should give priority to women, the poor and other disadvantaged groups for non-technical

jobs created by the Project and ensure 30% of the employment opportunity offered to them in project construction and operation periods; and also conduct training targeted at women's employment enlargement, such as training on housekeeping, tourism and catering services, so as to increase their income along with tourism development promoted under the Project.

6.4 Impact on Physical Culture Resources

According to the survey, all the other 3 components involve physical culture resources such as cultural relics or protection zones except the Shizhu component.

6.4.1 Rongchang Component

This component involves Wanling Ancient Town, a famous historical and cultural town and county-level cultural relic and Darong Bridge, a municipal-level protected historic site.

6.4.1.1 Wanling Ancient Town

Wanling Ancient Town is located between LS L1+265.298 and LS L1+325.231 at the left bank of the component. According to the information got by visiting the authority for cultural relics protection, Huguang Guild Hall and Zhao's Ancestor Temple (both are county-level cultural relics) are located at left bank; As on the left bank embankment has been constructed, construction will not be carried out on the left bank where Wanling Ancient Town lies. Therefore, the construction will not impact on the relics of Wanling Ancient Town on the left bank.

6.4.1.2 Darong Bridge

(1) Positional relation with the component

The left and right ends of Darong Bridge is located between the left bank (LS L1+265.298 ~ LS L1+325.231) and the right bank (LS R0+611.315 ~ LS R0+622.984) of Lukong Town.

(2) Impact on Darong Bridge

The left and right ends of Darong Bridge is located between the left bank (LS L1+265.298 ~ LS L1+325.231) and the right bank (LS R0+611.315 ~ LS R0+622.984) of Wanling Ancient Town. Because embankment has been built at left bank of Wanling Ancient Town, and no construction is conducted at that side, construction has no impact on left end of Darong Bridge. However, right end of Darong Bridge is located within the project range; therefore, during construction, mechanical excavation has some impacts on that ancient bridge, which may destroy stability and landscape of the bridge.

According to opinions of the government administration of cultural relics, protective range for Darong Bridge covers 2 meters from each end and 15 meters upstream and downstream of the bridge respectively. Thus, the authority requires that embankment construction for right bank should be beyond the protective range of Darong Bridge, avoiding any construction within the range. Meanwhile, rational layout is recommended during construction in Darong Ancient Bridge section, hand excavation that has lesser impact on the bridge being possibly adopted according to project conditions.

According to the construction arrangement, no construction is conducted on the left bank, construction outside the protective range line is adopted on right bank to avoid the protective range, and the construction is carried out through manual excavation, which therefore will have a little impact on Darong Bridge.

6.4.2 Tongnan Component

This component is located at the northwest of Tongnan Giant Buddha which is a national key cultural relic protection site. According to feasibility study, after comparing with other routes, final route selected for the component avoids the Giant Buddha Temple and ends at roadside on the left bank of Shengli Ditch in Group One of Shengli Village. The embankment does not cross Shengli Weir and has a straight-line distance of 270m with the nearest construction control zone of the Giant Buddha Temple. During the component construction, the site is arranged within the canal scenic spot that is away from the Giant Buddha Temple area; with no important scenic spots surrounded, the Temple is less influenced. Transporting of earth and stone and materials is mainly via Jinfo Avenue and surrounding secondary main roads.

EIA requires that the construction contractor shall deliver the construction scheme to the government administration of cultural relics protection in the Temple for comments and approval before construction. If fissures, inclining or other situations are found for protective cultural relics in the Temple, construction shall be stopped and the authority for cultural relics protection shall be informed immediately. Construction shall not be resumed until the continuous construction is proven to have no damage to the protective cultural relics within the Temple.

With several protective cultural relics in Tongnan County (e.g. embankment section II is located near the Giant Buddha Temple, a national key protective cultural relic), treatment of suspected cultural relics during construction is very important. Before commencing and mobilization, the construction contractor shall conduct relevant education about suspected cultural relics for the construction staff and safe technical disclosure of suspected cultural relics before construction. The construction contractor shall immediately stop the construction in the case of finding any suspected cultural relics, protect the site and report to the government administrations of cultural relic of Tongnan County and Chongqing Municipality for

authentication and treatment. Construction shall not be resumed until permission notice being received from the administrations, and personnel shall be specially assigned for keeping detailed texts as well as site videos and pictures for future reference. In general, the construction contractor shall protect and report immediately all the suspected cultural relics found during construction and prevent damaging, concealing and reselling of the suspected cultural relics.

Currently, no cultural relics or suspected cultural relics have been found in lands permanently and temporarily occupied due to Dafuba Embankment Construction. Refer to attachments for confirmation letters from the Administration of Cultural Relics of Tongnan County.

6.4.3 Pengshui Component

With natural and artificial factors, bank slopes of Xujiaba site are found with collapse and water & soil erosion. According to *Impact Assessment Report of Cultural Relics in Xujiaba Site* and *Cultural Relics Protection Law of People's Republic of China*, protection of original location and implementation of archaeological excavation measures are proposed to take for component-involving Xujiaba site; the site is divided into original location protection area, archaeological excavation area and ordinary protection area, with following range map for each zone. Almost no cultural relics have been found in the ordinary protection area; archaeological works are finished in the archaeological excavation area at the moment. From Fig. 6.3-1, the construction is only conducted in the archaeological excavation area and the ordinary protection area of the site, not in the original location protection area, which has less impact on the archaeological value of the site. Furthermore, operation of the flood control and bank protection work will protect the riverside bank slopes of the site, which benefits the follow-up protection works for most sites and preserve those sites well at the greatest extent. Besides, operation of crest roads will improve local traffic conditions, promote tourism and sightseeing in the Xujiaba site, which also benefits the transmission of the site cultural value. In general, operation of the work will be beneficial to protect and publicize the Xujiaba site and to develop its cultural relic value in the long term.

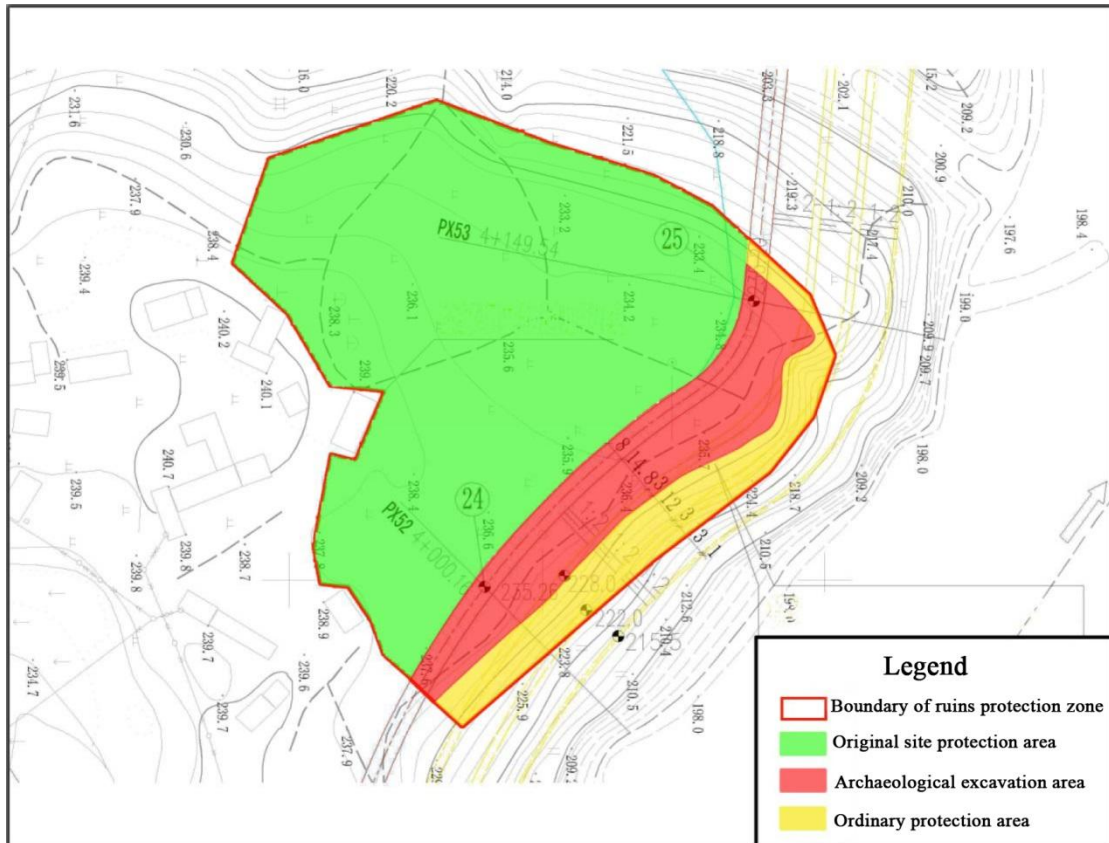


Fig. 6-1 Area of Xujiaba Site Occupied by Embankment

6.5 Cumulative Impact Analysis

Assessment process and methodology:

(1) The Project includes 4 project components, involving 4 rivers in 4 counties, for which cumulative impact assessment is not possible.

(2) According to field investigations, cascade power stations exist along all the 4 rivers and the aquatic ecological system has become fragmented. The Project construction belongs to embankment construction and sewage collection and treatment in nature and will not cause major destruction of ecological environment.

(3) The Project will support construction for sewage collection in the project areas, which will greatly reduce discharge of sewage pollutants into water bodies. Thus, the Project will cause positive impacts on water quality.

Therefore, cumulative impact of the Project can be analyzed based on its contributions to reducing of main pollutants of sewage discharge.

6.5.1 Water Environment Problems in Chongqing

6.5.1.1 Existing Problems

The “Twelfth Five-Year” is the critical period for Chongqing to build a moderately prosperous society in all aspects, to accelerate transformation of economic development mode and to meet significant opportunities for ecological construction and environmental protection. However, during such a rapid developing period of urbanization and integration of city and countryside, we still face serious challenges in water environmental protection in following aspects.

(1) Flood

Most cities of Chongqing are constructed along various rivers, and low flood control grade of the basins is caused by unique hilly landform, which severely threaten the safety of the cities along the rivers. Especially, some counties of Chongqing, usually located between remote basins and on the narrow urban development land, are most serious in this situation.

(2) Water pollution

During “Twelfth Five-Year”, industrialization, urbanization and integration of city and countryside are rapidly developed in Chongqing, resource and environment restrictions for economic growth are strengthened, and tasks of ecological restoration and pollution prevention and control are heavy. And during “Twelfth Five-Year”, ammonia nitrogen in the discharge reduction factors of total amount of water pollutant further increase the difficulty of total discharge reduction. It is predicted that total chemical oxygen demand and newly-added discharge amount of ammonia nitrogen are 124000 tons and 13000 tons respectively till 2015, thus discharge reduction of total main pollutant is very difficult.

Major causes for serious water pollution include:

① Industrial wastewater pollution: It is major pollutant of water in Chongqing due to discharging without treatment, discharging after unqualified treatment and undercapacity of receiving water in the case of qualified discharge.

② Non-point source pollution in rural areas: It is mainly caused by ineffective treatment of livestock pollution, aquaculture pollution, and fertilizer and pesticide pollution in croplands.

③ Domestic sewage pollution: It is mainly caused by insufficient capacity of the treatment plants, unstable operation of treatment facilities, lagging construction of sewage pipe network and ineffective environment supervision. Difference between

city and countryside in environmental protection level is large; especially for some county-level cities of which most small towns are restricted by incomplete municipal drainage pipe network, defective sewage collection system, shortage of sewage collection and treatment facilities and unstable operation, water pollution is much more severe. Those cause most rivers of Chongqing being polluted to different extent.

(3) Water & soil erosion and mudslide

As a typical hilly city, Chongqing suffers from rain scouring which may easily cause water & soil erosion due to sediment being scoured into the river channels.

6.5.2 Objectives Proposed in Planning

According to Planning for Ecological Construction and Environmental Protection of Chongqing During Twelfth Five-Year Period, the overall objective requires a breakthrough in ecological construction, effective controlling of major pollutant discharge, progressively solving of prominent environmental problems and obvious improvement in environmental quality till 2015. Refer to Table 6-16 for detailed objective indexes.

Table 6-16 Objective Indexes for Discharge Reduction of Water Pollutant in Chongqing

S/N	Name of Index	Current Situation in 2010	Objectives in 2015	Variation
1	COD (10 ⁴ tons)	42.6*	39.5	- 7.2%
2	NH ₃ -N (10 ⁴ tons)	5.6*	5.1	-8.8%
3	Water Qualities of Yangtze River, Jialing River and Wujiang River※	General Class II	General Class II	Maintaining

Remarks: ※ refers to current evaluation standard, and * refers to census data of pollution sources.

6.5.3 Major Measures Proposed in Planning

(1) Integrated improvement of secondary river pollution

We will promote integrated improvement of secondary river pollution, strengthen water monitoring for transboundary sections of secondary river, and implement annual objective water assessment for transboundary sections of secondary river. Till 2015, the qualified rate for water environment functional zone of secondary river monitoring section around Chongqing shall reach 85%. Based on various zones, functions and pollution situations, we will properly implement integrated improvement such as pollution control by interception, river channel treatment and ecological restoration in order to reach the objective of water

improvement. During “Twelfth Five-Year” period, 29 secondary rivers in Chongqing will be treated. Combined with model creating requirement, we finished integrated improvement of 5 rivers with unqualified water quality in main urban districts (Liangtan River, Huaxi River, Yipin River, Bibei River and Dongliang River) and treatment for 9 black and odorous rivers (Kuxi River, Tiaodeng River, Daxi River, Funiu Stream, Panxi River, Qingshui Stream, Chaoyang Stream, Xiaojia River and Tiaodun River) before 2012; treatment of 15 rivers in other districts and counties (Zhuxi River, Taohua River, Pengxi River, Laixi River, Xiaoan Stream, Longxi River, Longhe River, Wuqiao River, Daning River, Binan River, Linjiang River, Qijiang River, Daxi River (Wulong County), Xiaozhi River and Qiongjiang River) will be finished before 2015.

(2) Prevention and control of industrial wastewater pollution

① We will strengthen treatment of industrial wastewater, including further treatment in 124 enterprises before 2015.

② We will promote construction of wastewater collective treatment facilities in industrial zones by finishing construction in 74 industrial zones before 2015 (Baotao chemical industrial zone in Fuling District, Yanjia industrial zone in Changshou District, etc.).

③ On strengthening supervision and administration of sewage discharge in those enterprises, we will carry out license system of sewage discharge, publicize sewage discharge situations of key pollution enterprises regularly, and implement the system of environmental quality rating evaluation and management. We will make further efforts to supervision and monitoring of key pollution sources and environmental monitoring, promote installation of online monitoring devices in key sewage discharging enterprises, and improve two-level interconnection between the municipality and the district. We will carry out specific project in environmental enforcement, investigating and punishing environmental illegality according to law. We will establish and improve long-acting monitoring and management mechanism for pollution sources to ensure continuously stable operation of pollution treatment facilities and qualified discharge in key industrial enterprises in Chongqing, strengthen environmental verification for marketing enterprises and disclose punishments by the environmental department in time.

(3) Treatment of domestic sewage

① We will make overall planning for construction of sewage collection and treatment facilities in urban and rural areas of Chongqing, improve sewage collection and treatment facilities in urban areas, and ensure 90% urban domestic sewage being collectively treated. We will properly construct sewage collection and treatment facilities in small towns to ensure 75% of domestic sewage being

collectively treated. We will also promote rural domestic sewage collection and treatment to ensure 25% sewage being treated.

② We will construct urban sewage collection and treatment facilities by adhering to “construction of both treatment plant and treatment pipe network, and priority in the latter” to accelerate the construction of urban sewage collection and treatment plant and mating pipe network. We finished building, rebuilding and expansion of 17 urban sewage collection and treatment plants in main urban area (including Lijiatuo sewage collection and treatment plant in Banan District) to ensure effluent quality being qualifiedly discharged in those plants till 2013. We will finish construction of 54 urban sewage collection and treatment plants before 2015, including the sewage collection and treatment plant in Dazu District, with newly-added sewage collection and treatment capacity of 1487500 ton/d. We will construct or transform the mating secondary or three-level sewage pipe networks at the same time, carry out diversion of rain & sewage for the drainage system in the new urban area and for the old urban area by sewage collection and treatment transformation in order to improve operation efficiencies of sewage collection and treatment plants. Those plants built and operated before are provided with load rate of no less than 60%, and no less than 75% after being operated for 3 years. We will also strengthen our supervision on sewage collection and treatment facilities by installing online monitoring systems for all urban sewage collection and treatment plants to ensure qualified discharge of tail water. We will make further efforts to pipe network construction for reuse of reclaimed water, proactively promoting the reuse of recycled water from urban sewage plants.

③ Construction of the sewage collection and treatment facilities in the villages and towns in combination of collective treatment and distributive treatment will be accelerated, with priority given to those riverside towns (especially those key designated towns). We will accelerate the construction of the urban and rural domestic sewage collection and treatment pipe network, treating domestic sewage from those small towns adjacent to urban area in the built-up urban sewage collection and treatment plant; for those small towns of which the domestic sewage cannot be treated in the urban sewage collection and treatment plant, we will finish construction of mating pipe network which can be put into operation after construction by adopting some technologies with good efficiency, low construction and operation costs and easy management skills. During “Twelfth Five-Year” period, we will finish construction of 429 sewage collection and treatment plants in the villages and towns, with newly-added sewage collection and treatment ability of 801400 ton/d.

④ On the treatment of rural domestic sewage, we will carry out investigations on rural domestic sewage pollutions, and sort out the pollution situations and the treatment facilities. We will properly promote rural domestic sewage collection and treatment by constructing collective sewage collection and treatment facilities in the

market towns and villages involved in the areas of pollution source census and discharge reduction in the total amount of major pollutant; we will promote construction of easily managed small-sized sewage collection and treatment facilities with low investment and operation cost, such as artificial wetlands, stabilization ponds and constructed rapid infiltrations, in the rural areas with relatively concentrated population; and we will combine with the ecological homestead and income increasing project, accelerate the construction of methane-generating pits and promote wastewater treatment in the biological methods. We will strengthen the operation and management of rural sewage collection and treatment facilities and establish diversified investment mechanism to ensure daily operation of the funds and the facilities. We will also carry out the *Implementation Plans for Contiguous Rural Environment Treatment Project in Chongqing*, ensuring 10% administrative villages involved in the integrated improvement of rural environment till 2015.

(4) Prevention and control of rural non-point source pollution

① In terms of the prevention and control of livestock pollution, we will construct 1000 methane work sites in the breeding areas and joint households, 250 large- and medium-sized methane work sites and household methane facilities for 750000 families till 2015, treating 80% large-scale farm pollutions.

② In terms of the prevention and control of aquaculture pollution, we will promote license management, arrange rational layout and prohibit feeding cage culture within main stream and tributary backwater zone, drinking water protected zone and planned non-feeding cage culture zone in the Three Gorges Reservoir Region.

③ In terms of the prevention and control of the cropland chemical fertilizer and pesticide pollution, we will accelerate the adjustment of agricultural structure, advocate agricultural recycling economy, promoting the base construction for organic food, green food and pollution-free food, formulate favorable policies, encourage comprehensive utilization of the agricultural wastes and development utilization of biopesticides, and subsidy those peasant households who apply organic fertilizers and methane.

(5) Positioning of the proposed project

Combined with the “Twelfth Five-Year” planning, the proposed project aims at the integrated improvement of pollutions in the secondary rivers (Laixi River and Longhe River) and the first-level main streams (Wujiang River and Fujiang River). We will make 85% of the water environment functional zones in the monitoring sections of Laixi River and Longhe River reaching the standard and maintain the functions of

Wujiang River and Fujiang River areas at General Class II by implementing the project.

Meanwhile, the proposed project involves the collection, transportation, treatment in corresponding sewage plants and discharging of domestic sewage from the project-affected cities and villages, which solves the treatment problems in some county-level cities and most small towns where complete municipal drainage pipe networks have not been built and sewage collection system has obvious defects, and indirectly realizes discharge reduction of the pollutant.

6.5.4 Cumulative Impact Analysis

The implementation of the project plays a major role in upgrading the flood control level, retaining sewage and improving the water quality of the rivers. According to the comments from the headquarters of the World Bank in terms of the project, this report is approved to only give a cumulative impact analysis of the sewage.

During the “Twelfth Five-Year” period, the major pollutants in the water environment are COD and NH₃-N. Taking the total pollutant discharge amount in 2010 as the planning base, we are progressively promoting the discharge reductions in various pollutants by the implementation of the planning to realize the discharge reduction objectives in COD and NH₃-N as major pollutants during the “Twelfth Five-Year” period in Chongqing.

6.5.4.1 Major Pollutant Reduction for Priority Works

According to the environmental planning during the “Twelfth Five-Year” period, the priority works include:

- (1) Treatment of 29 secondary rivers;
- (2) Further treatment of industrial wastewater for 124 key enterprises;
- (3) Construction of wastewater collective treatment facilities in 74 industrial zones;
- (4) Construction and transformation of sewage collection and treatment facilities in 54 cities;
- (5) Construction and sewage collection and treatment facilities in 429 villages and towns, with newly-added sewage collection and treatment ability of 2288900 t/d.

After overall implementation of the planned priority works and environmental management, we will increase the reduction ability of chemical oxygen demand in domestic sewage by 220000 t/a and the reduction ability of ammonia nitrogen in domestic sewage by 26000 t/a. The total discharge amount of major water pollutants will be controlled, 29 major secondary rivers and 124 key industrial wastewater discharging sources will be further treated and the quality of water environment will be further improved.

6.5.4.2 Major Pollutant Reduction for the Project

Aiming at interception and collection of domestic sewage, the project involves delivering all the intercepted sewage to the corresponding sewage collection and treatment plants before being discharged, instead of directly treating the sewage, which could realize the reduction in water pollutant. The Tongnan component and Pengshui component of the project do not involve the construction of sewage interception pipe networks which are involved in other 2 components. Refer to Table 6-17 for pollutant discharge reduction in the project-affected area.

Table 6-17 Major Water Pollutant Discharge Reduction After Implementation of the Project

Name of Components	Main Work Contents	Reduction	Progress of Works
Shizhu component	<p>(1) Estuary of Longhe River and Niushiqian River to Qiaotou Yard: The newly-built sewage pipe at the right bank is with a diameter of d600 and a total length of 920 m.</p> <p>(2) Longhe Bridge to Longjing Bridge: The newly-built main sewage pipe along the Longjing Road is with a diameter of d1000 and a total length of 2440 m.</p> <p>(3) Longhe River to estuary of Jiaoshi stream: The newly-built main sewage pipe is with a diameter of d600 and a total length of 6326 m for both sides.</p> <p>(4) Estuary of Longhe River and Jiaoshi Stream to 400 m upstream of Juandong Bridge: The sewage pipe built along the sidewalks at the crest of newly-built embankment is of d600 and with a length of 2360 km.</p> <p>After completion of the pipe network, the intercepted sewage amount will be 12380 m³/d, 4518700 m³/a.</p>	Discharge reduction: COD 1988.21 t/a NH ₃ -N 144.59 t/a.	To be implemented
Rongchang component	<p>The sewage pipe network of 12.41 km needs to be built (including a gravity flow pipe of 4.85 km from the old houses of Zhao family at 1155 m upstream of Darong Ancient Bridge in Lukong Ancient Town to Erlangtan Bridge; a pressure flow pipe of 3.99 km from Erlangtan Bridge to Shabu; and a gravity flow pipe of 3.57 km from Shabu to current sewage interception main pipe in the Liansheng Bridge), and 1 lifting pump station needs to be built at about 300 m upstream of Erlangtan Bridge.</p> <p>After completion of the pipe network, the intercepted sewage amount will be 7890 m³/d, 2,879,850</p>	Discharge reduction: COD 1237.14 t/a NH ₃ -N 92.16 t/a.	To be implemented

	m ³ /a.		
Total		COD 3225.35 t/a NH ₃ -N 236.75 t/a	

6.5.4.3 Major Pollutant Reduction for Historical Projects Under World Bank Loan

According to the investigation, the Chongqing World-Bank-Loan Project Office was founded in October 1993, and has developed 6 projects under World Bank Loan, including:

(1) The completed projects: Chongqing Industrial Reform and Pollution Control Project, Chongqing Urban Environmental Project, a sub-project from the balance of the Chongqing Urban Environmental Project and Chongqing Small Town Environmental Improvement Project;

(2) The ongoing projects: Chongqing Coordinative Urban-Rural Area Development and Reform Project Phase I and Chongqing Coordinative Urban-Rural Area Development and Reform Project Phase II.

According to the investigation, only Chongqing Urban Environmental Project involves the discharge reduction in major water pollution among several historical projects under World Bank loan. According to the statistics, after the completion of sewage management component of Chongqing Urban Environmental Project, major water pollutants in Chongqing have been largely reduced, with a reduction of COD by 2690 t/a in 1999 sharply increasing to 57195 t/a and a reduction of BOD by 1304 t/a in 1999 sharply increasing to 24111 t/a now.

6.5.4.4 Cumulative Impact Analysis

According to relevant national and Chongqing municipal provisions, during and before the “Eleventh Five-Year” period, the major water pollutants are COD and BOD, and NH₃-N were not under control; however, the major water pollutants suggested during the “Twelfth Five-Year” period are COD and NH₃-N, BOD not included. Therefore, the cumulative indexes of COD and NH₃-N are taken for this calculation, seeing Table 6-18.

Table 6-18 Cumulative Situations of COD and NH₃-N

Classification of Works	Reduction of Pollutant (t)		Ratio in Total Reduction During the “Twelfth Five-Year” Period	
	COD	NH ₃ -N	COD	NH ₃ -N
The Project	3225.35	236.75	0.82%	0.46%
Previous Chongqing projects under World Bank loan	24111	/	6.10%	/

Priority works	220000	26000	55.70%	50.98%
Total	247336.4	26236.75	62.62%	51.44%

According to above analysis, all works proposed in the environmental planning during the “Twelfth Five-Year” Period are under construction as planned, so are all the pollutant discharge reduction works. The implementation of the proposed project could further promote the progress of the pollutant discharge reduction in Chongqing.

(1) The proposed project involves collection and transportation of currently directly discharged sewage to the sewage collection and treatment plant for treatment, which will improve the local water environment. The implementation of the project will realize reduction in discharge of COD (3225.35 t/a) and NH₃-N (236.75 t/a), respectively taking up 0.82% and 0.46% of the discharge reduction objective for each major pollutant in Chongqing during the “Twelfth Five-Year” period, which makes proactive contributions to the improvement of Chongqing water environmental quality.

(2) The discharge reduction objectives for all major pollutants made for Chongqing during the “Twelfth Five-Year” period are: 395000 t/a of COD and 51000 t/a of NH₃-N. After the implementation of the planned priority work objectives, 220000 t/a of COD and 26000 t/a of NH₃-N will being reduced, respectively taking up 55.70% and 50.98% of the discharge reduction objective for each major pollutant in Chongqing during the “Twelfth Five-Year” period, which makes proactive contributions to the improvement of Chongqing water environmental quality.

7 Mitigation Measures for Environmental Impacts

7.1 Mitigation Measures for Impact During Design Stage

Environmental protection measures for each component of the Project that are proposed at the "project feasibility study" stage are shown in Table 7-1.

Table 7-1 Environmental Protection Measures at Design Stage

Category	Environmental Protection Measures
Site and route selection design	<p>Reasonability of site selection is analyzed for construction material yard and construction road based on type of land to be occupied, size of impact, impact on agricultural production, etc.</p> <p>The optimum scale and site selection scheme is selected and submitted to the government of Chongqing Municipality, business supervising authority and the Owner of the Project for approval.</p> <p>(1) Tongnan component:</p> <p>1) For embankment line selection of embankment section I, both internal line scheme and external line scheme are compared, and the former is preferred, because this scheme involves moderate land occupancy and investment, shorter length, wider protected land and better visual effect, and it is more favorable to flood flowing and would exert lighter effect on Huangjiaotang spawning ground during construction.</p> <p>2) For embankment line selection of revetment section, the external line scheme is preferred, because this scheme would not narrow flood flowing section, and can make construction basically keep away from houses and make full use of flood land.</p> <p>3) For embankment line selection of embankment section II, the internal line scheme is preferred, because it involves low investment and wider vacant land for waterfront landscape planning.</p> <p>For the selection of embankment, anti-flood wall embankment and slope embankment are compared, and the latter is preferred.</p> <p>(2) Rongchang component:</p> <p>1) For route selection, internal embankment line scheme, middle embankment line scheme and external embankment line are compared, and the middle embankment line scheme is preferred, because in this scheme, the embankment width is basically consistent with that of the original river course, elevation of wall top is close to that of the original natural bank slope, and land occupancy is moderate.</p> <p>2) For selection of embankment, three types of embankments are compared, i.e. anchor foot + level I slope, anchor foot + level II slope and shelf retaining wall, and the first type is preferred, because it has better effect of ecological landscape.</p> <p>(3) Shizhu component:</p> <p>1) For route selection, scheme 1 is preferred, because it involves less floor area, less amount of earth-rock excavation and soil erosion, fewer environmental sensitive sites and lower investment.</p> <p>2) For selection of dredging method, cofferdam dredging is preferred, because it would exert lighter effect on environment in terms of land occupancy,</p>

Category	Environmental Protection Measures
	<p>construction method, vegetation damage, etc. (4) Pengshui component (lack of data).</p>
Ecological protection	<p>Fertile farmland to be occupied is minimized during site selection and general layout arrangement; Demolition and relocation are minimized; embankment is greened, with turf and landscaping vegetation planted on bank slope of embankment with mild slope to create riparian green corridor; The process with less sediment production is selected, and main embankment works is constructed without river-involved operations; The construction of Tongnan component staggers the fish spawning period.</p>
Noise	<p>Design of selected route should be optimized and the route should be kept as far away from residential area as possible; control of stationary noise source and flow noise source is strengthened, and construction time is under control.</p>
Surface water pollution	<p>Construction wastewater is comprehensively utilized after treatment; for Shizhu component, dredging wastewater is discharged after sedimentation treatment in grit chamber.</p>
Air pollution	<p>Management is strengthened, and high-grade fuel is used for construction machinery; construction area is enclosed, with water sprayed for dust suppression; road surface and site is cleared and vehicle under transportation is enclosed.</p>
Landscape	<p>Measures are taken to make bunding slope protection works harmonious with surrounding landscape, and openness, adjacency to water, and accessibility are considered in landscape design of the works.</p>
Cultural relics and historic sites	<p>During design, the Project area is investigated to determine whether cultural relics and historic sites exist; the selected route avoids Giant Buddha Temple, the national key cultural relics protection site, as well as its core scenic spot. Protection measures are proposed for site selection, construction methods and construction site arrangement of Giant Buddha Temple. Land utilization planning is adjusted properly during engineering construction planning, avoiding the original Xujiaba Site under protection. Prior to construction, the Owner would delimit protection zone of the original Xujiaba Site jointly with the cultural relics protection department and provide warning signs.</p>
Water and soil conservation	<p>Main works is provided with drainage ditch and turf slope protection, and gardens are greened and beautified; balance between excavation and filling of earth-rock as well as site selection design of temporary topsoil stockpile are optimized; the topsoil stockpile is covered and temporarily enclosed; dump area is provided with drainage ditches at both sides, with outlets connected with the grit chamber; the site is leveled after the temporary topsoil stockpile and dump area are completed, and then greened through scattering grass seeds or planting trees.</p>
Temporary construction site	<p>Attention needs to be paid to selection of the construction site at design stage, it is set within the scope of land taken up by dump area, without new land occupation. No construction site is set near the environmental sensitive site; Construction road is provided within protection zone of the embankment by extending the existing rural road as far as possible and partially by using levee crest as temporary road. When the construction road is designed to be set in an area temporarily occupied, large residential area, school and good natural vegetation are avoided as far as possible. After extension of the rural road is completed, the construction road would be kept as permanent road leading up to the embankment.</p>
Social impact	<p>The Project involves land occupation, demolition and resettlement, so design of main works is optimized, size of effect due to land requisition is minimized, farmland to be occupied and houses to be demolished are minimized, and influence of the Project on society, economy and people's livelihood is</p>

Category	Environmental Protection Measures
	<p>reduced to the largest extent;</p> <p>The governmental administrative authorities should develop policies and regulations consistent with compensation standards of the Project in accordance with the <i>Land Administration Law of the People's Republic of China, Regulations Concerning the Expropriation and Compensation of Premises on Stated-owned Land, Measures for Announcement of Land Requisitions</i> and the methods of Chongqing Municipality and Tongnan County for demolition and resettlement. The Owner and Contractor would keep close contact with and work in close cooperation with the government sector to timely distribute land compensation fees, resettlement fees and compensation fees for young crops to the farmers whose lands are expropriated based on the principles of making a concession to interests of the state, collective and individual, compensating reasonably and resettle properly; besides, they would timely distribute allowances for removal to the farmers relocated, and provide training of other agricultural technologies and non-agricultural technologies to the affected people, so as to reduce burden of the laborers affected by the land requisition and properly solve problems related to their livelihood.</p> <p>For relocated household, reasonable compensation is given in time based on the specified standards. Relocation may be completed in the way of paying for the demolished houses as resettlement allowance, or purchasing discounted houses built by the government. Anyway, it is required to adequately consult the affected people.</p>

7.2 Mitigation Measures for Impact During Construction Stage

Refer to the Table 7-2 for the environmental protection measures for the Project during construction stage.

Table 7-2 Environmental Protection Measures at Construction Stage

Category	Environmental Protection Measures
Ecological protection	<p>Prior to construction commencement, bulletin boards about protection of ecological environment and prevention of water and soil loss are provided at the construction site and in the surrounding area, and publicity and education of ecological environmental protection are taken for the Contractor;</p> <p>After constructors enter the construction site, they are immediately educated in terms of ecological resources protection to publicize knowledge about ecological environmental protection and relevant laws and regulations;</p> <p>Supervision of the work about ecological environmental protection is temporarily undertaken by environmental protection officers of the Supervision Department and Construction Department. The method of circuit supervision is adopted to inspect implementation of measures for ecological environmental protection and action of the constructors for ecological protection;</p> <p>Issues involving construction site and temporary construction road are handled by coordinating with local administrative department in advance, minimizing damage to soil and vegetation around the work zone;</p> <p>If temporary land utilization involves farmland or woodland, 30~40cm deep mellow soil layer of the topsoil is desquamated to be stacked or collected and preserved, and such farmland or woodland would be recovered by reclamation after construction completion;</p> <p>Management during construction period is strengthened, and the constructors are totally not allowed to fell woods around or destroy vegetation around;</p> <p>For vegetation that cannot be identified within the scope of land requisition, technicians of local forestry management station are invited to offer assistance. If such vegetation is protected by the state, it must be marked and transplanted to an unaffected place before construction;</p> <p>Construction activities are scheduled reasonably and arranged within the scope of land requisition and occupation, minimizing farmland and garden to be occupied as well as area to be affected by construction. The principle of retaining first and abandoning followed is adopted during construction. Drainage ditches and desanding pits are set around the construction area to prevent water and soil loss before excavation of topsoil;</p> <p>Excavation of earth and rock in the Project area should be planned in a scientific manner. Waste should be timely filled in the low lying area behind the embankment;</p> <p>Large-scale construction of earthwork and stonework is avoided in rainy season as far as possible. For the earthwork and stonework that are constructed in rainy season, earth and rock should be transported immediately after excavation and compacted immediately after filling, so as to avoid water and soil loss; temporary yard for earth and rock in rainy season is fenced simply and provided with interception ditch and floodway channel as well as simple grit chamber around. In case of rainstorm or high wind, the earth and rock stacked are covered to reduce degree of washing by rain and surface runoff;</p> <p>The process with less sediment production is selected. For the construction of main embankment works, river-involved operations and water body disturbance should be avoided; soil and water conservation measures should be strictly implemented; enclosing work should be done during construction; and it is forbidden to</p>

Category	Environmental Protection Measures
	<p>dump waste soil into the river course;</p> <p>For interruption of fishery capture and production as well as reduction of output due to construction of the Project, corresponding compensation should be given in ecological compensation agreement. Fishery administration department should supervise and coordinate, under the premise that economic benefit of fisherman is guaranteed, to avoid unnecessary interference as far as possible, reduce construction period and minimize the degree of impact on aquatic ecosystem caused by construction.</p>
Construction noise	<p>Under the premise that construction demands are met, advanced equipment with low noise, vibration and energy consumption should be selected whenever possible; maintenance and service of mechanical equipment should be strengthened to keep the noise at the lowest level.</p> <p>Reasonable arrangement of construction method and time: Construction time at night is under strict control, avoiding adverse effect of night work on environment to the largest extent. Construction activity that would cause environmental noise pollution is prohibited during the period from 22:00 p.m. to 6:00 a.m. of the next day. If night work is unavoidable due to requirement of production process or other special requirements, the Contractor should report for approval in accordance with relevant laws and regulations within 4 days before night work. The Contractor should post notice on site within one day before night work, informing nearby residents of relevant matters;</p> <p>Noise reduction measures should be carefully taken by the Contractor, with approved certificates for night work hung on a conspicuous location on site. Meanwhile, notice with construction cause and time should be posted on access route of residential agglomeration for publicity and explanation, trying to obtain understanding of the public and accepting supervision of the public and environmental protection law enforcement officer;</p> <p>Implementation of measures for noise reduction at the construction site: Before commencement of the construction, the Contractor should develop construction noise reduction scheme and build colorbond fencing wall of 1.8m high at the construction boundary. For construction activity to be carried out in the residential agglomerations along the route of the Project, the Contractor should post a notice at the construction site during construction to show project name, construction content, construction period, owner's contact information, contractor name, person in charge of the site and contact information, potential noise pollution and control measures to be taken;</p> <p>Reasonable layout of working equipment: Management of powered mechanical equipment in construction area should be strengthened. The construction machinery to be used at a fixed place should be installed at a place far away from the protected object, and a portable noise barrier should be set during construction with high-noise equipment, so as to reduce impact of construction noise on environment;</p> <p>It is prohibited to carry out night work that would cause noise pollution in the residential agglomerations along the route of the Project within 15 days before and during college entrance examination and senior high school entrance examination;</p> <p>Environmental publicity and education for the constructors should be strengthened to make them carefully implement all noise reduction measures and construct in a civilized manner. Under the premise that construction quality is guaranteed, construction progress should be accelerated and construction period should be minimized.</p> <p>The Contractor should handle well the relationship with the residents near the construction site, especially those who live very close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p>
Surface water pollution	<p>Management of construction machinery should be strengthened. Such situations as escaping, running-out, dripping and leaking should be avoided as much as possible; treatment facilities including permanent car washing station, oil trap and grit chamber and so on should be provided, so that oily wastewater can be reused after treatment in the oil trap and grit chamber;</p>

Category	Environmental Protection Measures
	<p>Domestic wastewater produced by the constructors should be treated with sanitary facilities of local farmers nearby;</p> <p>Materials at the construction site must be protected against rain and seepage with sufficient canvases and asphalt felts, preventing such materials from mixing with rainwater and flowing into water body;</p> <p>If construction activity is carried out near a water body, earth and rock should not be stacked at the side closer to the water body. If such case is unavoidable, temporary retaining wall should be constructed to prevent earth and rock from falling into river and causing impact on the water body and aquatic flora and fauna;</p> <p>Embankment should be greened immediately after construction completion, with turf and landscaping vegetation planted on bank slope of embankment with mild slope, so as to minimize degree of washing by rainwater to exposed earth surface and reduce impact on surface water.</p>
Air pollution	<p>The construction site should be enclosed. Fence and enclosure would be provided around the work area during construction to reduce diffusivity of dust nuisance. Firm and beautiful fences with height no less than 1.8m should be provided around the construction site in series.</p> <p>The ground should be grounded. Road in the construction area, access road and construction material stockpile area must be hardened, with road surface kept clean.</p> <p>Facilities for car washing and drainage must be provided at access of the construction area. Any car pulled out of the construction area must be washed out, without flying, scattering, leaking particles and carrying soil.</p> <p>Construction should be carried out in a civilized manner, with necessary measures for dust prevention taken. For dust production point where cement is mixed, unloaded and poured, simple dustproof facilities should be provided, such as shelter workshop, dust board and water sprayer. Number of times of onsite mixing should be minimized and such work should be kept far away from the object under environmental protection. The construction site should be arranged reasonably, and all aggregates should be stacked and stored in a unified manner and covered with protective cloth. Powdery materials such as cement should be transported in bag or tank. Transportation in bulk is prohibited. Besides, special warehouse should be set, with reliable measures for dust prevention provided.</p> <p>Water should be sprayed in the construction area to prevent dust. The Contractor should develop regulations on dust prevention by spraying water, and involved areas include working surface, road section, temporary dumping site and main road for transportation under construction as well as bare land not under construction. Frequency of water spraying should be determined by the Engineer based on site conditions and may be increased properly in case of high wind or dry weather.</p> <p>Management of transport vehicle: Cement, aggregate and other similar materials would easily generate dust nuisance. For transportation of materials that would easily scatter and leak, they must be loaded based on normative procedures. Closed transporter should be intact, neat and clean. Overloading is strictly prohibited.</p> <p>The Contractor must select the construction machinery and transportation facility conforming to relevant national sanitary standards and use high-grade fuel, so that the exhaust gas emitted meets relevant national standards. The construction machinery and transportation facility should be maintained and serviced frequently to prevent accidental leakage of gasoline and diesel.</p> <p>All the constructors would use clean energy sources such as natural gas, liquefied gas and electricity.</p> <p>The Owner should incorporate the special fund for dust control during construction into the cost estimate of the Project, and the Contractor should ensure that such special fund is used as designated.</p>
Solid waste	<p>(1) Rongchang component:</p> <p>1) Earth-rock excavated should be temporarily stored in the temporary stockpile in each construction area, some would be used for filling of embankment</p>

Category	Environmental Protection Measures
	<p>and the remaining wastes would be stored in the temporary stockpile for the time being and finally transported to Huangjinpo Public Dump Areas by means of vehicle through the existing road in Rongchang for stacking.</p> <p>2) The floaters and household wastes collected from the river course would be temporarily stored in the temporary stockpile, and then would be transported to Jiangjiagou Landfill by means of vehicle through the existing road in Rongchang for landfill disposal.</p> <p>3) The household wastes should be disposed by means of the existing local facilities.</p> <p>(2) Shizhu component:</p> <p>1) All of the dredging sludge would be transported to Yaodianzi Waste Treatment Plant under the operation of Limin Waste Treatment Co., Ltd. in Shizhu County for treatment in a grit chamber until the moisture content reaches up to 60%, and then subject to sanitary landfilling.</p> <p>2) The wastes would be temporarily stored in each temporary stockpile and then used for backfilling. The remaining wastes would be transported to Diaozui Dump Area in Shizhu County in a unified manner.</p> <p>3) The household wastes should be disposed by means of the existing local facilities.</p>
Solid waste	<p>(3) Tongnan component:</p> <p>1) For spoils, three dump areas would be set in the lowland behind the embankment, with floor area of 7.28hm², 4.94 hm² and 8.15 hm² respectively. The part stripped from the embankment would be used for placement of levee slope after humus soil is removed, and the remaining would be transported to the nearest dump area behind the embankment for backfilling. Most of soils excavated from the foundation are silty soils, unsuitable for filling of main parts of the levee body, so they would be backfilled the nearest area behind the levee. A small quantity of sandy gravels would be used for filling of the levee body; 2) The household wastes should be disposed by means of the existing local facilities. 3) Interception and drainage ditches should be provided around dump area before stacking, with fence set downstream to prevent water and soil loss. Materials should be compacted immediately after stacking and then ecological restoration and revegetation should be carried out timely.</p> <p>(4) Pengshui component:</p> <p>1) Two dump areas would be set for the spoils, and the dump area No. 1 is planned to be built at 750m upstream of starting point of the Project, with floor area of 19,600m² and volume of 100,000m³. The land to be occupied by the dump area is farmland. The dump area No. 2 is Shihuituo backfill material borrow which is also used as dump area upon completion of use as borrow, with floor area of 17,200 m² and volume of 300,000 m³. 2) The household wastes should be disposed by means of the existing local facilities. 3) Interception and drainage ditches should be provided around dump area before stacking, with fence set downstream to prevent water and soil loss. Materials should be compacted immediately after stacking and then ecological restoration and revegetation should be carried out timely.</p>
Cultural relics and historic sites	<p>In accordance with World Bank Business Policy OP4.11-Cultural Relic, the Contractor should organize activities about training on protection of cultural relics and capability improvement before arranging the constructors to enter the construction site. Such activities should be directly included in the Project, rather than delayed to be developed together the action that may be taken in the future. Relevant expenses should also be included in total cost of the Project.</p> <p>Prior to construction, the Owner should submit the construction scheme to the cultural relics protection department for comments and approval, and construction may begin after approved. If such situations as cracks or leaning of protected cultural relics are found, construction should be suspended immediately and the cultural relics protection organization should be informed in time. Follow-up construction may proceed after it is confirmed that no damages would be caused to the protected cultural relics by such construction.</p> <p>If any suspected cultural relic is found occasionally during construction, such construction should be suspended immediately and the site should be protected,</p>

Category	Environmental Protection Measures
	with local cultural relics protection department informed in time. Follow-up construction may proceed only after confirmation of relevant departments. During identification and protection of such suspected cultural relics, the Contractor may arrange other work that would not affect such identification and protection.
Social impact	<p>The bidding document should contain feasible scheme for construction transportation and reduction of traffic impact; Bulletin boards should be set up at a visible position in the construction area, indicating hotlines and contact names of the project contractor, construction supervisor and local environmental protection bureau, for the convenience of the people to contact relevant departments when they are affected by noise, air pollution, inconvenient traveling and other adverse impact due to construction.</p> <p>Crossings of main road sections for construction transportation should be provided with warning signs, reminding social vehicles to bypass in time; visible construction sign, safety sign for vehicle and passenger as well as letter for "the three responsibilities in the gate area" should be hung at major access of the construction site. Vehicle that accesses to the construction site should be clean. Overloading is prohibited. Access road must be hardened.</p> <p>Time and route for transportation of the construction materials should be planned reasonably to avoid blocking the existing road; the vehicle that accesses to the site should run along the specified route at the specified time, avoiding the road section with high visitors flow rate as far as possible. The vehicle should be washed out before running from the site to the road, and it should not run on the road if its tyres carry any soil. Materials that would easily scatter and leak should be enclosed for transportation.</p> <p>Personnel should be designated to direct the traffic at entrance and exit of the construction site to prevent congestion.</p> <p>The construction site should be kept as far away from residential agglomeration as possible, reducing impact of construction noise and dust on the residents.</p>

Refer to Table 7-3 for the environmental protection measures for environmental sensitive sites involved in the Project.

Table 7-3 List of Environmental Protection Measures for Environmental Sensitive Sites

Component	Environmental Sensitive Site	Impact Factor	Environmental Protection Measures
Tongnan component	Five households of No. 1 community of Xinsheng Village (15-50m away from boundary of 1# construction site) and Yutong Wenwu School of Tongnan County	Construction noise	<p>The control of stationary and flow noise sources should be strengthened and the construction time should be controlled. Construction that would cause environmental noise pollution should be forbidden from 22:00 p.m. to 6:00 a.m. of the next day and from 12:00 a.m. to 14:00 p.m. The Contractor should handle well the relationship with the residents of No. 1 community of Xinsheng Village, especially those who live very close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability. Noise equipment should be kept far away from the sensitive site to the largest extent. If construction nearby the sensitive site is unavoidable, a portable sound-proof wall should be set between the equipment and sensitive site. For fixed equipment, an acoustic shed should be set up. If obvious adverse impact is still caused to the sensitive sites around after the above measures are taken, fund compensation should be paid for the affected residents. The noise equipment should be arranged at the side as far away from the school as possible.</p>
		Construction dust	<p>Reduction of dust by water spraying: The powdery material should be transported in sealed state and the construction site should be arranged reasonably, i.e. the mixing plant and aggregate yard should be provided in the west of the site and at the side</p>

Component	Environmental Sensitive Site	Impact Factor	Environmental Protection Measures
			far away from the environmental sensitive site. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.
	Giant Buddha Temple	Reasonable route selection	The selected route should avoid Giant Buddha Temple, the national key cultural relics protection site, as well as its core scenic spot.
		Construction scheme	<p>Prior to construction, the Owner should submit the construction scheme to the Cultural Relics Protection Department of the Giant Buddha Temple for comments and approval, and construction may begin after approved. If such situations as cracks or leaning of protected cultural relics in the Giant Buddha Temple are found, construction should be suspended immediately and the cultural relics protection organization should be informed in time. Follow-up construction may proceed after it is confirmed that no damages would be caused to the protected cultural relics in the Giant Buddha Temple by such construction.</p> <p>During construction nearby the Giant Buddha Temple, the construction equipment should be installed as far away from the Temple as possible, and the construction that would cause severe vibration should not be carried out nearby the Temple.</p> <p>If any suspected cultural relic is found during construction, such construction should be suspended immediately and the cultural relics preservation administration should be informed in time. Follow-up construction may proceed after such cultural relic is excavated and cleaned.</p>
		Other measures	Connection of scenic spot of the Giant Buddha Temple with the embankment should be completed, forming an integrated flood control system. Monitoring of flood level in the Fujiang River should be strengthened.
	Water point of alternate water source of Fujiang River	Adjustment of water intake location	Tongnan County People's Government moves the water intake of alternate water source down for 300m according to TNF [2013] No. 261 document and adjusts to the place downstream and with a distance of 300m to the existing water intake. After that, the toe near the river would not be located within the land area of Class A protection zone of drinking water source.
		Water quality protection	Domestic wastewater should not be directly discharged until treated using existing facilities; and construction wastewater should be reused as spraying water for dust reduction of the construction site after treated in the grit chamber instead of being discharged..
	Dingming Mountain–Canal Scenic Spot	Reasonable route selection	The route should be selected reasonably to avoid core scenic spot of the Dingming Mountain–Canal Scenic Spot. The route should be within the scope of ordinary scenic spot.
		Landscape	Measures are taken to make bunding slope protection works harmonious with surrounding landscape, and openness, adjacency to water, and accessibility are considered in landscape design of the works. The embankment is greened, with turf and landscaping vegetation planted on bank slope of embankment with mild slope. The nursery stocks should be selected to fit growth in the local area and simply conserved in future.
		Temporary	The land temporarily occupied during construction should be revegetated, with the original land function restored

Component	Environmental Sensitive Site	Impact Factor	Environmental Protection Measures
		land occupation	simultaneously.
Tongnan component	Fujiang River National Wetland Park	Site selection	The dyke is located within the wise use zone of Fujiang River National Wetland Park.
		Wetland protection	The construction should be carried out only within the occupied land of the Project; Wetlands outside the occupied land shall not be allowed to be destroyed during construction; no species other than those planned to be introduced should be brought into the site for restoration..
	Huangjiaotang and Xibutang spawning grounds	Construction methods	The process with less sediment production is selected. For the construction of main embankment works, river-involved operations and water body disturbance should be avoided; soil and water conservation measures should be strictly implemented; enclosing work should be done during construction; and it is forbidden to dump waste soil into the river course;
		Construction noise and wastewater	The equipment with high noise should be reasonably arranged, i.e. at the side as far away from the river course as possible. The construction wastewater should be recycled after treated and domestic wastewater should be treated with existing facilities instead of discharged into Fujiang River.
		Ecological compensation	For interruption of fishery capture and production as well as reduction of output due to construction of the Project, corresponding compensation should be given in ecological compensation agreement. Fishery administration department should supervise and coordinate, under the premise that economic benefit of fisherman is guaranteed, to avoid unnecessary interference as far as possible, reduce construction period and minimize the degree of impact on aquatic ecosystem caused by construction.
		Avoidance of breeding season	River-involved construction should avoid breeding season of fishes (March-May) so as to alleviate the negative impact of construction on spawning ground.
Shizhu component	55 households within the scope being 50m away from construction site	Construction noise	<p>The control of stationary and flow noise sources should be strengthened and the construction time should be controlled. Construction that would cause environmental noise pollution should be forbidden from 22:00 p.m. to 6:00 a.m. of the next day and from 12:00 a.m. to 14:00 p.m.</p> <p>The Contractor should handle well the relationship with surrounding residents, especially those who live very close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p> <p>Noise equipment should be kept far away from the sensitive site to the largest extent. If construction nearby the sensitive site is unavoidable, a portable sound-proof wall should be set between the equipment and sensitive site. For fixed equipment, an acoustic shed should be set up.</p> <p>If obvious adverse impact is still caused to the sensitive sites around after the above measures are taken, fund compensation should be paid for the affected residents.</p>
		Construction dust	Reduction of dust by water spraying: The powdery material should be transported in sealed state and the construction site should be arranged reasonably, i.e. the mixing plant and aggregate yard should be provided in the west of the site and at the side

Component	Environmental Sensitive Site	Impact Factor	Environmental Protection Measures
			far away from the environmental sensitive site. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.
Rongchang component	52 households within the scope being 50m away from construction site	Construction noise	<p>The control of stationary and flow noise sources should be strengthened and the construction time should be controlled. Construction that would cause environmental noise pollution should be forbidden from 22:00 p.m. to 6:00 a.m. of the next day and from 12:00 a.m. to 14:00 p.m.</p> <p>The Contractor should handle well the relationship with surrounding residents, especially those who live very close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p> <p>Noise equipment should be kept far away from the sensitive site to the largest extent. If construction nearby the sensitive site is unavoidable, a portable sound-proof wall should be set between the equipment and sensitive site. For fixed equipment, an acoustic shed should be set up.</p> <p>If obvious adverse impact is still caused to the sensitive sites around after the above measures are taken, fund compensation should be paid for the affected residents.</p>
		Construction dust	Reduction of dust by water spraying: The powdery material should be transported in sealed state and the construction site should be arranged reasonably, i.e. the mixing plant and aggregate yard should be provided in the west of the site and at the side far away from the environmental sensitive site. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.
	Darong Bridge	Avoidance measures	The left bank would not be subject to construction. The construction of the right bridge head of the ancient bridge should be carried out outside its protection zone delimited, i.e. avoiding the protection zone of the ancient bridge.
		Protective measures	<p>The construction methods with small vibration impact on the environment, such as artificial construction, should be adopted during the construction. Meanwhile, construction should be carried out within the control area (with the upstream and downstream being 2m from the bridge head and 15m from the bridge body) of the protection zone of the ancient bridge.</p> <p>Prior to construction, the Owner should submit the construction scheme to the Cultural Relics Protection Department of the Giant Buddha Temple for comments and approval, and construction may begin after approved.</p> <p>Fixed monitoring equipment should be installed at the right bank of Darong Bridge during construction. If such situations as cracks or leaning of the ancient bridge are found, construction should be suspended immediately and the cultural relics protection organization should be informed in time. Follow-up construction may proceed after it is confirmed that no damages would be caused to the protected cultural relics in the Giant Buddha Temple by such construction.</p>
		Other measures	Connection with the embankment should be completed, forming an integrated flood control system. Monitoring and warning of flood level should be strengthened.
Pengshui component	19 households within the scope	Construction noise	The control of stationary and flow noise sources should be strengthened and the construction time should be controlled. Construction that would cause environmental noise pollution should be forbidden from 22:00 p.m. to 6:00 a.m. of the next day and

Component	Environmental Sensitive Site	Impact Factor	Environmental Protection Measures
	being 50m away from construction site		<p>from 12:00 a.m. to 14:00 p.m.</p> <p>The Contractor should handle well the relationship with surrounding residents, especially those who live very close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p> <p>Noise equipment should be kept far away from the sensitive site to the largest extent. If construction nearby the sensitive site is unavoidable, a portable sound-proof wall should be set between the equipment and sensitive site. For fixed equipment, an acoustic shed should be set up.</p> <p>If obvious adverse impact is still caused to the sensitive sites around after the above measures are taken, fund compensation should be paid for the affected residents.</p>
		Construction dust	<p>Reduction of dust by water spraying: The powdery material should be transported in sealed state and the construction site should be arranged reasonably, i.e. the mixing plant and aggregate yard should be provided in the west of the site and at the side far away from the environmental sensitive site. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.</p>
	Water intake of Shangtang Water Plant	Protective measures	<p>Agreement has been made with Shangtang Water Plant that water intaking and riprapping shall be staggered in time, namely, the Contractor shall inform the Shangtang Water Plant to conduct the water intaking after the riprapping has been done nearby the water intake and the SS concentration goes back to the original level.</p> <p>The construction management should be strengthened and corresponding purification measures should be taken by the water plant according to the water quality conditions.</p>
	Xujiaba Site	Avoidance measures	<p>Protection zone of the original Xujiaba Site should be delimited. The Owner should properly adjust land utilization planning during engineering construction planning to avoid the protection zone of the original Xujiaba Site: (1) protect the Site in strict accordance with the delimited protection zone. Prior to construction of the Project, the Owner need to delimit the protection zone of the original Xujiaba Site jointly with the cultural relics protection department and provide warning signs.(2) The Owner should adjust the engineering construction planning to avoid engineering operations such as rolling compaction, excavation, backfilling and stacking of materials in the delimited protection zone of the original Site. The ground environment of the area where the Site is located should not be changed.(3) In case there is no way to avoid the delimited protection area of the original historical site due to the construction of municipal works, such as road construction and pipeline embedding, causing excavation unavoidable, detailed construction planning drawing needs to be submitted to the cultural relics protection organization for review and approval. Meanwhile, separate working program for protection of cultural relics should be prepared, and then the construction may begin after archaeological excavation is implemented in corresponding areas.(4) If any suspected cultural relic is found during construction, such construction should be suspended immediately and local cultural relics preservation administration should be informed in time. Follow-up construction may proceed after confirmation of relevant departments.</p>

7.3 Mitigation Measures for Impact During Operation Stage

After the Project is implemented, flood control standard would be consistent with the planned functional standard, and river water quality and landscape effect would also be improved. The Project itself would not produce water, gaseous and solid pollutants, so environmental protection measures would focus on noise prevention of sewage lift pump.

Sewage pump stations involved in the Project include a wastewater pump station of Rongchang component and the Three Gorges wastewater pump station for water supply and Zhongba Bridge wastewater pump station of Shizhu component. The three pump stations are provided with special pump houses. The pumps are equipped with cushions and all joints are flexible joints, so as to reduce impact of noise on surroundings.

8 Impact Analysis of Land Requisition and Resettlement

The resettlement action plan (RAP) for the Project consists of 4 individual RAPs for the 4 components and 1 general RAP report. Contents of this section are all from the general RAP.

8.1 Project Impact

Land acquisition and resettlement for the Project affects 4 counties, 5 towns/subdistricts and 14 villages/communities, among which permanent land acquisition affects 4 counties, 5 towns/subdistricts and 14 villages/communities. Demolition and relocation of rural houses affects 4 counties, 5 towns/communities and 11 villages/communities. In addition, 3 counties, 4 towns/subdistricts and 10 villages/communities are affected by both land acquisition and relocation.

A total of 6258 people from 1493 households are affected by land acquisition and resettlement of the Project, among which 244 people from 59 households are affected by both of these two issues, and 46 people from 15 households are from the vulnerable groups.

The land permanently acquired for the Project covers 1997.2 mu, among which the rural collective land covers 1288.73 mu (including cultivated land of 703.42 mu) and the allocated state-owned flood land covers 708.47 mu. The permanent acquisition of rural collective land affects 6033 people from 1470 households.

Temporary land acquisition covers 584.95 mu, including 371.28 mu of cultivated land.

Demolition and relocation for the Project affects a total of 64 households of rural residents, 3 enterprises and public institutions, 2 shops, 10 individual farmers and 12 unestablished illegal buildings with a total relocation area of 23,352m² and 469 people. An area of 17,317m² rural residential houses is demolished and relocated, accounting for 74.16 % of the total area; that of the enterprise and public institutions is 80 m², accounting for 0.34 %; that of the shops is 100m², accounting for 0.43%; that of the individual farmers is 1,885m², accounting for 8.07%; and that of the unestablished buildings is 3,970m², accounting for 17%.

In addition, 24 kinds of structures and attachments on the ground surface as well as special facilities are affected by the Project.

8.2 Resettlement Compensation Policy of the Project

The resettlement compensation policy executed for the Project was prepared in accordance with *Regulation on the Implementation of the Land Administration Law of the PRC* (August, 2004), *Guidance for Improvement of Compensation and Resettlement System for Land Acquisition* (November 3, 2004), *the State Council's Decision on Deepening Reform and Managing Strictly Land* (October, 2004), *Notice on Issues about Strengthening Land*

Regulation and Control issued by the State Council (August, 2006), Property Law of the PRC (March, 2007), Notice on Further Administration of Land Acquisition issued by the Ministry of Land and Resources (June, 2010), Regulations on Land Administration of the Chongqing Municipality (No. 53 Directive issued by Chongqing Municipal People's Government, March, 1999), Compensation and Resettlement Method for Land Acquisition in the Chongqing Municipality (No. 55 Directive issued by Chongqing Municipal People's Government, January, 1999), Notice on the Issues about Further Regulation of Compensation and Resettlement Standards for Land Acquisition issued by the Chongqing Municipal People's Government (January, 2013), relevant laws and regulations of counties, as well as resettlement policies of the World Bank.

The main policies and principles are: 1) Measures, where necessary, should be taken to minimize the negative impacts of resettlement; 2) Suggestions from the communities should be considered and the ones do enhance living standards and livelihood of affected people should be adopted; 3) The compensation and resettlement schemes would improve living standard of resettlers, or at least help them regain their previous living standard before the launch of the Project; 4) Negotiations with resettlers should be conducted meticulously to involve them fully into the planning and implementation of the resettlement schemes; 5) Compensations would be made for all affected properties as per all the replacement costs; 6) The principles of Compensation Before Demolition should be followed to the greatest extent. Resettlers should obtain all compensations for their loss before land acquisition and demolition for construction. Acquisition of land and relevant properties shall not be carried out until indemnifications are paid, and resettlement locations as well as relocation subsidies are provided, if necessary. 7) Confirmation of qualifications of resettlers. Qualification of resettler is confirmed on the day when the notice on demolition and relocation is published. After that day, resettlers are not allowed to build, expand or rebuild houses. The purposes of utilization of the houses and land shall not be changed. The land shall not be leased and the houses shall not be leased, bought or sold. Persons moving in after such day do not have qualifications of resettlers.

8.3 House Building Rehabilitation and Re-establishment Plan

House /building demolition and relocation involves 64 homesteads of rural residents, 12 households of unestablished buildings, 4 enterprises and public institutions, 2 shops, and 10 individual farmers.

(1) Rehabilitation of rural residential houses

The 4 components all involve demolition and relocation of rural residential houses covering a total area of 17,317 m², and 272 persons from 64 households. After getting compensation as per the replacement prices, residents whose homesteads are demolished can, at their discretions, build houses on allocated land by themselves for resettlement, purchase discounted houses built under the government plan, or get paid for their demolished houses as resettlement allowance. Refer to Table 8-1.

Table 8-1 Demolition and Relocation Scheme for Rural Residential Houses

Component	Getting Cash Compensation for Demolished Houses	Purchasing Discounted Houses Built under the Government Plan	Self-building of Houses for Resettlement
Tongnan component	√	√	
Rongchang component	√	√	√
Pengshui component	√	√	√
Shizhu component	√	√	

?

Purchasing discounted houses built under the government plan

Tongnan component: If relocated households purchase discounted houses built under the government plan, houses within the housing arrangement standard of 30 m² per capita can be bought in accordance with the compensation standards for brick-concrete structure houses. Houses larger than the building area for resettlement yet not exceeding 5 m² can be bought at a price of RMB 450/m² (50% of the construction and installation price). Houses exceeding building area for resettlement by more than 5 m² yet not exceeding 10 m² can be bought at a price of RMB 1800/m² (comprehensive construction cost). Houses exceeding building area for resettlement by more than 10 m² can be bought at a price of RMB 2400/m² (price of commercial residential building at the same location).

Rongchang component: If relocated households purchase discounted houses built under the government plan, a purchase agreement would be entered between the Rongchang Land Resources and Housing Management Bureau and Lukong Town/Changzhou Subdistrict Office on one hand and the relocated household on the other hand, by which the relocated household can apply for discounts on the houses to be bought from the Rongchang Land Resources and Housing Management Bureau as per the building area standard of 30 m² per resettler. Pengshui component: If relocated households purchase discounted houses built under the government plan, houses within the housing arrangement area of 30 m² per capita can be bought in accordance with the compensation standards for brick-concrete structure houses. Resettler can select houses built under the government plan on condition that it is not larger than the original legal dwelling space by 5 m². Houses larger than the building area for resettlement due to design of the house yet not exceeding 5 m² can be bought as per the price for brick-concrete structure houses. Houses exceeding the building area for resettlement by more than 5 m² can be bought as per the construction and installation price.

Shizhu component: If relocated households choose discounted houses built under the government plan, houses with an area equal to their original legal dwelling space can be selected for replacement. If structures of the original houses of the relocated households differ from that of the houses built under the government plan, the relocated households should pay supplementary price difference for structure based on specified standards. Resettler can select the house built under the government plan with its area within 10 m²

larger than the original legal dwelling space for replacement. A house with an area larger than the original dwelling space yet not exceeding 10 m^2 due to design of the house can be bought at RMB 2500/ m^2 (the construction and installation price). If the area of the house to be bought is larger than the original dwelling space by more than 10 m^2 , the part exceeding 10 m^2 should be bought at RMB 3500/ m^2 (the average sales price of commercial residential building within the area for land acquisition and demolition).

⑦ Allocation of land for self-building of houses for resettlement

Rongchang component: If the relocated household builds houses on allocated land by themselves for resettlement, there are two methods for land allocation. The first method: The state-owned land is selected by the relocated households at their discretions in the component area in the Lukong Town and Changzhou Subdistrict, and then uniformly allocated by the Rongchang Land Resources and Housing Management Bureau. The standard for homestead allocation is 15 m^2 per capitates. The second method: The relocated households will be paid for RMB 66,667/mu (i.e. RMB 100/ m^2) as subsidies for adjustment of the homestead. Then they can, at their discretions, adjust within their groups to select a homestead to build houses. The area of homestead can be adjusted is 30 m^2 per capita.

Pengshui component: If relocated households build houses on allocated land by themselves for resettlement, the state-owned land should be uniformly designated and allocated by the Land Resources and Housing Management Bureau of the Pengshui County. The standard for homestead allocation is 30 m^2 per capita. Xiatang at the opposite bank of the component area is temporarily designated for resettlement. The houses should be uniformly designed by the government and built by farmers themselves. The relocated households need to pay land costs for RMB 48/ m^2 . But the compensation for the homesteads of farmers due to land acquisition is adequate for payment of such land costs.

⑧ Getting cash compensation for demolished houses

If the relocated household prefers getting paid as resettlement allowance, he can obtain various kinds of compensations and subsidies for houses, relocation, relocation transition and resettlement. The relocated households may purchase commercial residential buildings at their discretions, and the Owner of the Project and the government will provide them with house information in the adjacent location or other areas.

(2) Affected enterprises and public institutions

A total of 4 enterprises and public institutions are affected, with 1 state-owned enterprise affected by Shizhu component and 3 enterprises and public institutions affected by Tongnan component. Refer to Table 8-2 for recovery scheme of affected enterprises and public institutions.

Table 8-2 Recovery Scheme of Affected Enterprises and Public Institutions

Component	Enterprises and Public Institutions	Relocation	Cash Compensation
Tongnan component	Hongyanzui Aggregate Plant	√	-
	Dafu Aggregate Plant	√	-
	Zitong Subdistrict Farm Machinery Station	-	√
Shizhu component	Pipe Fitting Plant	√	√

(3) Affected shops

Based on one for one (a new house will be compensated when an old one is demolished), owners of 2 shops affected by the Shizhu component has the priority to choose, at the relocation sites where discounted houses are built under the government plan, the first floor as their shops for continuous operation. In addition, the owner of the component will compensate the loss from suspension according to the standard temporary compensation, i.e. two-year net profit of the shop.

(4) Affected individual farmers

A total of 11 individual farmers are involved in this project. Refer to Table 8-3 for resettlement scheme.

Table 8-3 Resettlement Scheme of Individual Farmers

Component	Individual Farmer	Resettlement Scheme
Tongnan component	Huang Shuangquan(Animal Farm owner)	Getting cash compensation for demolished houses
	Fu Hongquan(Animal Farm owner)	Getting cash compensation for demolished houses
	Li Jianguo (Animal Farm owner)	Getting cash compensation for demolished houses
	Tu Xinzhong(Planting Farm owner)	Getting cash compensation for demolished houses
	Zhang Quanhua (Animal Farm owner)	Getting cash compensation for demolished houses
Rongchang component	Chen Dewen (Edible Mushroom Plant owner)	Readjusting homestead to build houses for continuous operation
	Luo Linan(Open-air Tea Garden owner)	Getting cash compensation for demolished houses
	Liu Zhichu(Processing Shop owner)	Readjusting homestead to build houses for continuous operation
	Xia Hengjian (Fishpond owner)	Readjusting homestead to build houses for continuous operation
Shizhu component	Deng Junhua (Fish Farm owner)	Getting cash compensation for demolished houses
	Ma Fuzi (Duck Farm owner)	Getting cash compensation for demolished houses

(5) Affected unestablished houses

A total of 12 unestablished houses are involved in Pengshui component. For this component, the owners of the above houses will obtain compensation for material and labor cost.

8.4 Income Recovery Plan

A total of 1288.73 mu of rural collective land are permanently acquired for the project, involving 4 counties, 5 towns/subdistrict and 14 villages/communities, and affecting a population of 6,033 from 1,470 households.

Due to most linear land acquired for the dyke, a small area of land of each affected group of villagers will be acquired, with farmland affected rate per capita of 0-76.3%. Moreover, as the affected farmland is mainly located near the river and vulnerable to flood all year round, fewer cash crops with high yield are planted on such farmland. Therefore, after land acquisition, the loss in per capita annual income is RMB 0-884, with total loss rate of per capita income of 0-16.71%. As a consequence, the land acquisition has a slight impact on the villagers' income loss.

The affected farmers will obtain reasonable compensation. The output of land of different types and per capita farmland vary with the project-affected areas, resulting in different compensation standards. According to different locations and types of acquired land, the standard land compensation is RMB 15,000-17,000 per mu, and the standard resettlement subsidy is RMB 35,000-36,000 per capita. Except Shizhu, in the remaining 3 components, young crops and ground attachments (Rongchang, Pengshui)/ground attachments (Tongnan) are subject to comprehensive fixed compensation. According to standard land compensation and resettlement subsidy of each county, the land compensation is 21-430 times the average annual output value of the land. Currently, there are 14 years before the termination (in 2027) of next rural collective land contract, while the compensation for permanently acquired land of each group of villagers is far greater than 14 times, meeting the compensation requirements.

According to the methods specified in documents of counties where the components are located, the number of rural residents becoming urban residents will be calculated by $(\text{area of acquired cultivated land} + 0.5 \text{ times uncultivated area}) / \text{per capita cultivated area of collective economic organization with land acquired}$, in which the areas of orchard garden and grassland will be calculated as cultivated area. There are 1,661 rural residents becoming urban residents assigned in this project. According to the standard, after acquisition of contract land of the farmers with land acquired, if the remained cultivated area is less than 0.5 mu per capita on the basis of household, besides the number of rural residents becoming urban residents calculated according to the above standard, the farmers with land acquired can apply to increase such number on the basis of household until the remained cultivated area of this farmer is more than 0.5 mu per capita. In addition, the farmers with demolished houses located in the county planning area can apply to become urban residents on the basis of household, provided that they are willing to withdraw from the contract land. According to compensation policy and standard, the resettlement compensation for rural residents becoming urban residents is RMB 35,000-36,000 per capita by calculation, which is enough for the payment of retirement insurance.

For the old at retirement age, after one-off payment of all the retirement insurance, they can withdraw the pension from the next month after the approval of land acquisition compensation and resettlement scheme according to the law. According to the standard in 2013, the basic pension is RMB 500/month, which is increased by RMB 35/month per person from January 1, 2013; on this basis, the pension is increased by RMB 3 per person again for a full year based on the payment years (excluding converted working years). For the people at age of 75 on December 31, 2012 or older, the pension is increased by RMB 50/month per person. For the people at age of 75 since January 1, 2013, from the month when the old is at age of 75, the pension for the old is raised from RMB 50/month per person to RMB 100/month per person.

For the farmers losing their lands and becoming urban residents, the local government will organize labor skill training and provide employment opportunities for them.

As the land of the affected farmers without becoming urban residents is relatively reduced after land acquisition, to improve the output and keep the farmers' normal income unaffected, some supportive measures have been taken by relevant government departments and town government/subdistrict office, to adjust the industrial structure, encourage the farmers to plant cash crops to increase the agricultural output. All the groups of villagers will also coordinate with the farmers to improve the agricultural infrastructure.

Project-affected villagers willing to become urban residents are either doing business in cities or working in the county, and living close to the city/town. Therefore, the change from rural residents to urban residents has an insignificant impact on their living expenses.

8.5 Recovery Plan for the Vulnerable Groups

The vulnerable groups mainly refer to poverty-stricken groups with both individual and family living standard below the minimum subsistence level, the "five guarantee" family, the disabled, psychopath, orphan, lonely old people and female-headed households. According to the investigations for the Project's impact hold in May and October of 2013, there are 46 people of 15 households, and mainly the orphan, lonely old people and female-headed families.

Among them, there are 4 households of poverty family, accounting for 26.67% of the total; 3 households of disabled family, accounting 20%; 7 households of female-headed family, accounting for 46.67%, and 2 households of lonely old family, accounting for 13.33% of the total.

The poverty lines of the counties in 2012 are as follows: RMB 2,200 for Lukong Town and Changzhou Subdistrict in Rongchang County, RMB 1,944 for Linjiang community residents committees in Pengshui County, RMB 2,000 for Xinsheng Village, RMB 1,400 for Qianjin Village and RMB 1,600 for Shengli Village in Tongnan County. According to project impact investigation conducted in May and October 2013, there is a population of 46 from

15 households consisting of project-affected vulnerable groups, mainly including the old living alone, poverty-stricken households and female-headed households.

In addition to the above compensation policy for land acquisition and demolition, the vulnerable groups can enjoy other preferential policies. For example, in Rongchang component, the vulnerable groups can directly obtain support of RMB 2,200 from the local civil affairs department; in Shizhu component, the households enjoying the minimum living guarantee can obtain subsidy of RMB 180/month per person, while the disabled and the old at age of 70 or above, besides the above subsidy, can obtain additional RMB 30/month per person, and the households enjoying the five guarantees can obtain subsidy of RMB 265/month per person; in Tongnan component, the rural households enjoying the minimum living guarantee can directly obtain support of RMB 185 from the local civil affairs department, the eligible old living alone will be included in rural households enjoying the five guarantees, can obtain support according to the standard of RMB 270/month per person. In addition, families of disabled can obtain free training and employment opportunities, while the female heads of households can obtain free training about vegetable cultivation and breeding. By training, members from such families will also be recommended for employment.

These vulnerable groups can also have the priority to become urban residents. From the next month after the payment of retirement insurance, the old at retirement age from such families can obtain pension of at least RMB 550/month, contributing to great improvement of their living quality. In addition, the labor force from these families can have the priority to engage in non-technical work during the construction of the project and river maintenance upon completion, so as to help improve the living standard.

8.6 Total Cost and Implementation Plan

For this project, the total resettlement budget is RMB 223,837,500, including RMB 80,409,900 (accounting for 35.92%) for permanent land acquisition compensation; RMB 10,269,900 (accounting for 4.59%) for temporary land acquisition; RMB 40,563,500 (accounting for 18.12%) for compensation for resettled rural residents; RMB 560,000 (accounting for 0.25%) for compensation for affected enterprises and public institutions; RMB 12,000 (accounting for 0.01%, while the shop building already been compensated in resettled rural residents) for compensation for affected shops; RMB 1,896,400 (accounting for 0.85%) of compensation for affected individual farmers; RMB 16,741,200 (accounting for 7.48%) for compensation for affected ground attachments and special facilities. The total cost of resettlement is included in the cost of the whole project.

The owner of the component pay compensation for land and demolition to the resettlement implementer which pay land compensation and resettlement subsidy to the groups of villagers affected by land acquisition, with the subsidy for young crops directly paid to the affected households. The groups of villagers allocate the land compensation and resettlement subsidy based on different resettlement modes. The resettlement implementer,

in accordance with the house demolition contract signed, directly pay house compensation to the house owners by installments. It also directly pays the compensation for enterprises and public institutions, shops and infrastructure to their property owners. The resettlement implementer must submit copies of contract associated with land acquisition and demolition and fund payment documents to the owners and project office of each county/district for filing.

8.7 Organizational Responsibilities

As administrative and coordinate organization responsible for land acquisition, demolition and relocation for the Project, the Chongqing World-Bank-Loan Project Leading Group and the Chongqing World-Bank-Loan Project Office give guidance to World-Bank-Loan project office of each county to formulate resettlement action plan for each component based on social safeguard policy of the World Bank, and supervise the implementation of resettlement and compensation plan during operation of the Project.

Relevant leaders from each county government are responsible for the World-Bank-Loan project office of each county which consists of leaders from the land resources and housing management bureau and bureau of water resource. The main tasks of the World-Bank-Loan project office of each county are to prepare, or entrust design institute to prepare, resettlement action plan of their county; coordinate work of each department responsible for land acquisition demolition and relocation; supervise implementation of land acquisition, demolition and relocation; complete at regular intervals the internal monitoring report on implementation of resettlement action plan of their county; and report to the Chongqing World-Bank-Loan Project Office.

The owner of the component in each county is responsible for implementation of the each component. During resettlement, such activity is supervised and managed by specially-assigned person. The owner of the component is mainly responsible for entrusting the designer to prepare resettlement action plan; investigating the resettlement; confirming the resettlement action plan and entrusting or organizing the implementation work; supervising and managing resettlement activities and appropriating capital in the mean time; reporting resettlement progress to the World-Bank-Loan project office of each county at regular intervals; and preparing internal monitoring report.

In terms of arrangement of the resettlement implementer, the Owner of the Project would entrust and coordinate with land resource department of each county (or land acquisition office or section under the land resource department) to implement the resettlement work of the Project. The main responsibilities of the implementer are: to participate in preparation of resettlement action plan; execute resettlement activities based on resettlement action plan approved by the World Bank; handle procedures related to land acquisition, demolition and relocation; promote resettlement policies of the Project; and organize the public to participate in relevant activities, etc.

Town/subdistrict resettlement working team, community neighborhood committee/village committee and villagers group participate in the component survey; assist preparation of Resettlement Action Plan; involve in investigation of the Project; organize the public to participate in relevant activities; promote the resettlement policy for demolition and relocation; implement, inspect, monitor, and record demolition and resettlement activities within their own towns; assist to handle relevant demolition and resettlement procedures; supervise land acquisition, demolition of houses and auxiliary structures, and reconstruction and relocation of houses; take charge of capital management, transfer and payment for affected people; coordinate and handle conflicts and problems in work; organize resettlement activities such as production and development; report complaints and suggestions of resettlers to the superior; provide assistance to poor households for resettlement, etc.

Table 8-4 Implementing Institutes and Persons in Charge of Resettlement for Each Component

Component	Specific Implementing Institute	Responsible Person	Telephone
Tongnan component	Tongnan Land Resources and Housing Management Bureau	Xiang Yi	44569936
Rongchang component	Rongchang Land Resources and Housing Management Bureau	Lai Wenli	13908348006
Pengshui component	Pengshui Land Resources and Housing Management Bureau	Yan Hailin	13908270778
Shizhu component	Shizhu Land Resources and Housing Management Bureau	Gao Xulin	73378408

The Chongqing World-Bank-Loan Project Office, established in 1993, is experienced in management and implementation of World-Bank-Loan project. But most World-Bank-Loan project offices and resettlement implementer in each county and district operate World-Bank-Loan project for the first time, thus lacking experience of resettlement implementation and management. In order to ensure smooth implementation of the action plan, the Chongqing World-Bank-Loan Project Office strengthens capability of each implementer from the following aspects: 1) Strengthen personnel allocation. Personnel in organization and organization at each level consist of various special technicians and administration staff. All personnel must own appropriate expert knowledge and management quality; 2) Strengthen training. Experts have been organized for training of major staff from the organization at each level ever since May, 2013. The training contents include resettlement policy of the World Bank (OP4.12), regulations and policies of land acquisition and demolition, socio-economic investigation methods, and schemes of production and living rehabilitation of resettlement. During implementation of the Project, personnel participating in land acquisition and resettlement of the Project will continue receiving training. Contents of such training include resettlement policy, resettlement implementation and management, resettlement monitoring and assessment, etc; 3) Provide adequate capital and equipment to ensure high work efficiency; 4) Strengthen report system

and internal monitoring to timely resolve problems; 5) Establish external monitoring and evaluation system and early-warning system.

9 Impact Analysis of Environmental Risks and Dam Safety Evaluation

The Project has four components. Since the road on the levee crest of the Project is urban branch road and scenic road on which access of transportation vehicles are not allowed, transportation of hazardous substances is not related to such road of the Project. Therefore, environmental risk of the Project mainly involves in impacts arising from leakage of sewage pipeline.

9.1 Environmental Risk Analysis

9.1.1 Identification of Environmental Risks

9.1.1.1 Identification of Environmental Risk Factors

Environmental risk are mainly due to pipeline leakage caused by corrosion, construction defects and artificial destruction.

(1) Leakage caused by corrosion

Leakage of sewage pipelines may be caused by corrosion of the sewage and soil along the pipeline.

(2) Construction defects

The construction defects mainly refer to that the quality of pipe connection fails to meet relevant requirements leading to gaps, cracks and even fracture.

(3) External factors

9.1.1.2 Identification of Major Hazard Installations

According to results of identification based on *Identification of Major Hazard Installations for Dangerous Chemicals* (GB18218-2009) and *Guidance for Supervision and Administration of Major Hazard Installations* (AJGXT Zi [2004] No. 56), the Project does not have any major hazard installations.

9.1.2 Analysis on Causes

9.1.2.1 Causes of Accidents

Refer to Table 9-1 for factors easily leading to accidents.

Table 9-1 List of Accident Causes

Accident Source	Accident Causes
Leakage of pipeline	<ol style="list-style-type: none"> 1. External interruptions mainly refer to earthquake, earth slide, debris flow, loess collapsibility, slump, collapse, flood or artificial destruction by the third party. 2. Pipeline corrosion 3. Defects of tubes and pipes and construction

9.1.2.2 Occurrence Probability of Accident

The sewage pipe network is laid mostly along the embankment or the existing road and there is no particular corrosive road section; Accident is unlikely to happen to tubes and pipes or during construction under strict management; External interruption is occasional; In addition, the process of laying sewage pipeline develops well. Therefore, the occurrence probability of pipeline leakage of the Project is very low.

9.1.3 Consequence Analysis of Environmental Risks

Leakage of sewage pipeline mainly leads to pollution to water body and soil due to corrosion of sewage. In the meanwhile, the leaked sewage smells terrible.

Pollution of water body mainly causes pollution to water quality, affects three grounds on the downstream, deteriorates water quality at the water intake on the downstream, and affects the health of human body.

Sewage collected in the Project is mainly domestic sewage containing few toxic and hazardous substances such as heavy metal. Therefore, its pollution to the soil is relatively low.

Foul smell due to sewage leakage retaining around the leakage source and along the leakage line which would pollute the ambient air around.

9.1.4 Prevention and Mitigation Measures Against Environmental Risk

Refer to Table 9-2 for prevention and mitigation measures against environmental risk of the sewage collection and treatment project.

Table 9-2 Prevention and Mitigation Measures against Environmental Risk

Time Period	Risk Type	Prevention and Mitigation Measures
Construction period	Leakage of pipeline	<ol style="list-style-type: none"> 1. Adhere to the policy of "Safety First, Prevention First, and Comprehensive Control". 2. Construction workers must strictly follow the three principles: wear safety helmet before entering construction site, wear safety belts while working at heights, and no falls from heights. 3. Construction machine (equipment) with acceptable quality must be selected for construction; 4. During construction, both the transportation burden and surrounding traffic are heavy. Therefore, the Contractor should fully consider impacts of transportation on the construction progress and safety. Safety signs should be set. The work time and tasks should be arranged reasonably. 5. Construction at night or under dim light in the construction site should be provided with additional lighting facilities; 6. The mechanical equipment should be inspected at regular intervals. Problems found should be resolved timely. The mechanical equipment should be operated strictly based on operation specifications. Error operation should be avoided as much as possible to prevent mechanical injury. In addition, the safety protective devices for the mechanical equipment should be sensitive and effective; 7. Strengthen safety education to construction workers, especially new workers who participate in construction for the first time and also migrant workers; If there is more than one contractor in the construction site, cooperation and communication should be strengthened to ensure construction safety at all aspects. 8. Strengthen assessment of the qualifications of the Construction Supervisor and the Contractor. 9. Strengthen management and examination on the construction planning as well as safety management during test run. 10. Avoid three-dimensional cross-operation in the construction to the greatest extent. 11. During construction of the Project, the Owner, the survey institute, the Designer, the Contractor, the Supervision Engineer of the Project and other units related to safety production of the construction project must follow specifications of laws and regulations of safety production, so as to ensure safety production of the construction project, and undertake safety production responsibilities of each construction project according to law.
	Leakage of sewage collection and treatment work	<ol style="list-style-type: none"> 1. Strictly control procurement of raw materials to exclude any unacceptable products; 2. Select skillful unit for construction, and supervise the construction quality by a competent third party to reduce construction error; 3. Strictly follow construction specifications and prohibit rude construction; 4. Strengthen quality inspection of pipeline. Conduct water test to exclude defects at the joints and base metal to increase safety of pipeline; 5. During construction, strengthen supervision and ensure construction quality; 6. Establish construction quality assurance system to enhance work level of the construction inspector and strengthen inspection methods; 7. Establish strict regulations and rules. Defects found should be timely corrected and relevant record should be made; 8. Attention should be paid to construction quality and especially to that of pipelines crossing rivers.
Operation period		<ol style="list-style-type: none"> 1. Inspection should be carried out at regular intervals (once every half year). Maintenance and replacement should be made timely to prevent accident of pipeline leakage; 2. Signs at the points where pipeline crosses the river should be clear and definite, and should be visible at any direction and angle; 3. The frequency of patrol work should be strengthened to enhance its effectiveness;

Time Period	Risk Type	Prevention and Mitigation Measures
		4. The sections of pipeline crossing the river should be inspected once every day; 5. During flood period, attention should be paid especially to sections of pipeline crossing the river to ensure safety; 6. Construction is prohibited within the protection scope of pipeline.

9.1.5 Risk Emergency Preparedness Plan

9.1.5.1 Organizational Arrangement and Responsibilities

(1) Organizations

For the project, the emergency command group related to the management departments (Rongchang Urban Utilities and Landscaping Bureau, Shizhu Urban Utilities Bureau) during operation is responsible for the emergency organizations.

The emergency command group obeys the command of the superior emergency command organization, and is responsible for the on-site emergency command. According to the successful experiences and existing problems during implementation, the emergency command group adjusts and modifies the plan timely. Meanwhile, after accidents, special personnel are assigned to collect, sort and file all emergency records, documents, etc.

(2) Responsibility Assignments

In the plan, responsibility assignments of each member of the emergency organizations should be identified, mainly including:

- ① Who, how and where to alarm;
- ② Time and method for reporting the accident to the superior (personnel and contact means);
- ③ Who will organize the rescue and control accidents;
- ④ Use and distribution of emergency apparatus;
- ⑤ The channel to communicate with the media and the channel for accident information release;

9.1.5.2 Emergency Facilities, Equipment and Apparatus

Necessary materials and equipment shall be equipped for emergency repair, rescue, and site protection and cleaning. Emergency apparatus should be provided in advance for preparation, and inspected regularly so as to maintain in good conditions.

9.1.5.3 Emergency Communication

Smooth communication equipment and communication network shall be equipped, such as, cell phone and satellite phone. In the event of an accident, the group shall take actions timely, contact with the relevant rescue department to get assistance quickly, and get to the accident scene to emergency repair and handle within the shortest time, thus, minimizing the impact of accident.

9.1.5.4 Emergency Monitoring

In case of sewage spill, monitoring shall be performed mainly on water.

9.1.5.5. Emergency Treatment Measures

- (1) Pump in time;
- (2) Set the temporary cofferdam as the temporary storage site.

9.2 Dam Safety Evaluation

For dam safety evaluation, the conclusions of *“Report on Dam Safety Evaluation for Chongqing Small Town Water Environment Treatment Project”* are directly referenced

9.2.1 Conclusions

(1) Dazu County Yutan Reservoir, Wujiang Pengshui Hydropower Station of Pengshui County and Shizhu County Tengzigou Reservoir were completed around 2005. Currently, with good design level, feasible engineering measures, good quality control system during construction, and acceptable construction quality, the dam safety has a certain degree of prosperity. The dam can operate as per design. Tongnan County Sankuaishi Power Station is established in 1979. Till now, after renovation and maintenance for several times, some uncertain hidden dangers still exist. Shaungjiang cascade hydroelectric station is planned to be built 500m from the downstream in 2016, and the Sankuaishi Power Station Dam will be removed in 2018, thus, it can operate as per design basically before 2018.

(2) During on-site inspection, except for some uncertain hidden dangers of the Sankuaishi Reservoir, obvious abnormalities were not found on the dams of other three reservoirs.

(3) In the design, the corresponding safety monitoring measures were considered basically. But, some reservoirs were not monitored timely, and the monitoring data could not be analyzed in time, which became a weak link in safety management.

(4) From site inspection, it can be found that there are some uncertain hidden dangers exist on the Sankuaishi Reservoir, which is planned to be removed in 2018. After establishment of Shaungjiang cascade hydroelectric station, the dam safety will be improved

greatly.

(5) Except that the Sankuaishi Reservoir belongs to the moderate-size reservoir, the other three reservoirs are large-size reservoirs. Although dam safety administrators and configuration have already satisfied the relevant regulations in China, there are gaps and inadequacies, compared with the actual need for safety management, which is the weak link currently, and also a key link needed to be greatly strengthened in the future.

(6) In china dam safety management regulation, the reservoir management organization is required to prepare the operation, maintenance and supervision manual. The OMS manual is not prepared for all the four reservoirs. In order to meet the requirements of World Bank Project Office, narrow the gap, and make the dam safety management more scientific and effective, administrative personnel is required to be trained for preparation of OMS manual, that is, introduce the advanced concept of the word bank on dam safety, and how to prepare the operation, maintenance and supervision manual.

(7) For the four reservoirs, there is a certain gap between the preparation situation of emergency plan and the requirements of the word bank. According to actual situation, for preparation of reservoir emergency plan, there are difficulties about technology and fund, that is, technically, higher requirements are required, and economically, enough support is lacked.

(8) Under normal conditions, the Sankuaishi Power Station Dam can maintain the basic operation till 2018; and for the operation safety under abnormal conditions, it is suggested to invite the qualified organized to analyze and evaluate, and put forward solutions.

9.2.2 Countermeasures and Recommendations

(1) Tongnan County Sankuaishi Power Station

① Consider both dam body reinforcement and seepage prevention, and reinforce the dame body;

② Carry out seepage prevention for the soft foundation of dam;

③ Restore and reinforce the riprap of the damaged part of the downstream of the soft foundation of the dam;

④ Improve the dam safety monitoring facility;

⑤ During operation, enhance safety monitoring of dam hydroproject structures, strengthen sorting and analysis of monitoring data; enhance observation of downstream energy dissipation and riverbed erosion when flood, especially devastating flood, is discharged via spillway, and in case of any abnormality, report and treat timely so as to ensure safe operation of the Project.

⑥ Suggest identifying the safety of dam from restoration to 2018 when the dam is removed.

⑦ With regard to the current situation and the planning of removal before 2018, before removal, enhance monitoring, and in case of any abnormality, report and treat timely so as to ensure safe operation of the Project.

⑧ Suggest modifying the safety management system, and implement the management personnel in place.

(2) Dazu County Yutan Reservoir

① During operation, enhance safety monitoring of dam hydroproject structures, strengthen sorting and analysis of monitoring data; enhance observation of downstream energy dissipation and riverbed erosion when flood, especially devastating flood, is discharged via spillway, and in case of any abnormality, report and treat timely so as to ensure safe operation of the Project.

② Pay high attention to water environment safeguard, and strengthen the protection of water source. The reservoir is the main water source for urban water supply in Dazu, Rongchang, Shuangqiao, etc. Relevant organizations should pay high attention to water environment safeguard, strengthen the monitoring of quality of drinking water source and the protection of water source point, and supervise the perfect risk treatment and early warning mechanism, thus, avoiding water pollution accident in reservoir, and ensuring water supply safety. Meanwhile, Dazu government should take effective measures, to enhance water pollution prevention in the rain collection area of reservoir.

③ Strengthen the patrol inspection of dam, in strict accordance with *Dam Observation and Patrol Inspection System (trail)*, and treat timely in case of any problem.

④ Strengthen dam safety management, prepare the operation, maintenance and supervision (patrol inspection) manual as soon as possible, and gradually realize institutionalization, documentation and establishment of standard procedures of the dam safety management through technology training.

(3) Wujiang Pengshui Hydropower Station of Pengshui County

① Along with the increasing water level of reservoir, increase monitoring frequency, especially, focus on monitoring seepage on dam foundation, between roller compacted concrete layers, and dam abutment on both bank, because since reservoir filling, the water level has been controlled below the flood limit water level of 287 m, and the Project has not went through the normal pool level of 293 m.

② Due to large size and velocity of orifice radial gate, and frequent operation, perform flood discharge with small opening so as to produce vibration, suggest making efforts to monitor so as to avoid operation at vibration area, and meanwhile, strengthen site

inspection during flood discharging.

③ Due to the fact that the water release structures have not went through the flood, suggest inspecting the downstream energy dissipation area after flooding every year, and solve the problems timely in case of any.

④ Strengthen dam safety management, prepare the operation, maintenance and supervision (patrol inspection) manual as soon as possible, and gradually realize institutionalization, documentation and establishment of standard procedures of the dam safety management through technology training.

(4) Shizhu County Tengzigou Reservoir

① After flood discharging of dame, inspect and maintain the plunge pool, slope protection on both banks behind the dam timely. Improve the automatic system of hydrologic data collection and transmission, till the reservoir scheduling and operation of power station.

② Strengthen dam patrol inspection, enhance the deformation monitoring of dam abutment resisting force body, and especially, pay attention to monitoring under the operation condition of low water level at high temperature, low water level at low temperature and high water level at low temperature.

③ Strengthen dam safety management, prepare the operation, maintenance and supervision (patrol inspection) manual as soon as possible, and gradually realize institutionalization, documentation and establishment of standard procedures of the dam safety management through technology training.

(5) Train the safety monitoring personnel for the four reservoirs, carry put observation according to requirements of specification, and master the data analysis method gradually.

(6) Suggest the Municipal Project Office to organize the personnel related to the each Municipal (County) Project Offices and reservoirs concentrate on technical training for preparation of OMS manual as soon as possible, so that the OMS manual can be prepared according to the requirements of world bank for each reservoir.

10 Alternative Analysis

10.1 Comparison of “With Project” and “Without Project” Options

Alternative analysis focus on comparing the environmental impacts in two circumstances of “with the Project implemented” and “without implementation of the Project”, from the perspective of social development and environment improvement.

- (1) Option I: “With-Project” option.
- (2) Option II: “Without-Project” Option.

The pros and cons of the above two options are shown in Table 10-1.

Table 10-1 Comparison of “With-Project” and “Withou-Project” Options

Category	Option I: With-Project	Option II: Without-Project
Merits	<ol style="list-style-type: none"> 1. The comprehensive water environment improvement project construction conforms to the overall planning of coordinative development of Chongqing; 2. Project construction meets the requirements of urban overall planning of the Project, and the requirements of ecological constructive planning in project area, which is one of the basic works for development of small towns; 3. Project construction is beneficial to improving flood control capability and ensuring safety of public life and property; 4. Project construction will realize the collection and centralized treatment of sewage, and emission reduction of pollutants; 6. The planed land value in construction area of town will be increased to promote urban development, and job opportunity will be enlarged to boost economic development. 	<ol style="list-style-type: none"> 1. Current environment situation remaining unchanged, various environment impacts in construction period and operation period under Option I avoided; 2. No change to the land use situation, no land occupied for the construction.
Demerits	<ol style="list-style-type: none"> 1. During construction period, certain impacts will be caused on the aquatic ecosystem, especially pawning ground, feeding ground, winter ground; 2. Riverside natural landscaper will be transformed to artificial landscape; 3. Construction of pump station and etc. will increase the sources of noise. 4. In the occupied area, the land use pattern will change to some extent, which has limited impact on ecological integrity in the region. 	<ol style="list-style-type: none"> 1. For the residents along the river, their lives and properties are threatened by flood; 2. The sewage is discharged directly without collection for treatment, which will aggravate the river pollution; 3. In the city, the land use value can not be increased, thus, economic development lags behind.
Comprehensive analysis	From social and environmental perspective, the Option I is superior to the Option II.	

It can be seen from the table that, the “Without-Project will not cause environmental impact during construction period and operation period of the Project, and the scheme with the Project will bring a certain environmental impact, which can be avoided and reduced by

taking corresponding environmental protection measures; and meanwhile, project construction can protect the safety of residents' lives and properties along the river, improve environmental quality, improve living standards, and increase job opportunity. The operation brings long-term social and environmental benefits. Thus, from the angle of society and environment, the "With-Project" option is superior to the "Without-Project" option, and project construction is very necessary.

10.2 Comparison of Project Construction Schemes

The Project construction covers flood control works and sewage works. Comparison is carried out from the aspects of society, environment, cost, technology, etc.

10.2.1 Comparison of Construction Schemes for Flood Control Works

10.2.1.1 Rongchang Component

(1) Comparison of Routes

The embankment line of the works is arranged in Darong Bridge, and the scheme of avoiding its protection range is taken, without destroying the landscape of the Darong Bridge. The embankment line is arranged along the bank line of river channel, without curve cut-off. Therefore, the embankment line is basically arranged along the current river bank line. The comparison and analysis of the component embankment line is carried out from internal embankment line scheme (scheme I), middle embankment line scheme (scheme II) and external embankment line (scheme III).

The Rongchang component is divided into the upstream section and downstream section. Comparison of route is carried out from internal embankment line scheme, middle embankment line scheme and external embankment line. For comparison of changes of water level after construction with different schemes, see Table 10-2.

Table 10-2 Alternative Construction Scheme of Rongchang Component (unit: m)

Items	Internal Embankment Line Scheme (Scheme I)		Middle Embankment Line Scheme (Scheme II)		External Embankment Line Scheme (Scheme III)	
	Upstream section	Downstream section	Upstream section	Downstream section	Upstream section	Downstream section
Natural water surface	311.37 - 312.12	311.37 - 312.12	311.37 - 312.12	311.37 - 312.12	311.37 - 312.12	311.37 - 312.12
Water surface after construction	309.94 - 311.57	309.94 - 311.57	311.36 - 312.04	309.94 - 311.57	309.89 - 311.47	309.94 - 311.57

Table 10-3 Comparison of Embankment Line Schemes of Dyke in Rongchang Component

Alternatives		Internal Embankment Line Scheme (Scheme I)	Middle Embankment Line Scheme (Scheme II)	External Embankment Line Scheme (Scheme III)	Merits and Demerits
Society	Relocation scale due to the comparison (households)	25 households	39 households	50 households	Scheme I is preferred, and scheme III is the worst.
	Floor area (10,000 m ²)	30.2	33.3	36.4	Scheme I is preferred, and scheme III is the worst.
Cost	Land acquisition cost (RMB 10,000)	1368.43	1520.48	1689.42	Scheme I is preferred, and scheme III is the worst.
	Cost of temporary occupation (RMB 10,00)	143.23	159.14	176.83	Scheme I is preferred, and scheme III is the worst.
	Total investment (RMB 10,000)	18088.93	15883.94	15940.91	Scheme II is preferred.
Environment	Environmental sensitive site	7 village communities, and 15 households	7 village communities, and 24 households	7 village communities, and 35 households	Scheme I is preferred, and scheme III is the worst.
	Impact on water and soil loss	1,490t, the newly added investment in the conservation of soil and water is about RMB 4.6 million.	745t, the newly added investment in the conservation of soil and water is RMB 2.3077 million.	1,110t, the newly added investment in the conservation of soil and water is about RMB 3.4 million.	Scheme II is preferred.
	Impacts on Darong Bridge	Dyke is closest to Darong Bridge, so the embankment construction has a great impact on Darong Bridge	Dyke is closer to Darong Bridge, so the embankment construction has a slighter impact on Darong Bridge than that of the internal embankment line scheme	Dyke is far from Darong Bridge, so the embankment construction has the smallest impact on Darong Bridge	Scheme III is preferred, and scheme I is the worst.
Technology	Technical difficulty and feasibility	Access road is connected to the existing road, with convenient transportation and good construction condition; small excavation volume, large backfilling volume	Access road is connected to the existing road, with convenient transportation and good construction condition; normal excavation volume, and moderate work quantity	Access road is connected to the existing road, with convenient transportation and good construction condition; large excavation volume, small backfilling volume and the minimum	Scheme II is preferred.

Items \ Alternatives		Internal Embankment Line Scheme (Scheme I)	Middle Embankment Line Scheme (Scheme II)	External Embankment Line Scheme (Scheme III)	Merits and Demerits
			and large embankment cross section		
	Food flowing of river channel	Flood flowing section of river channel is occupied, which is bad for the flood flowing	Flood flowing section of river channel is not occupied	Flood flowing section of river channel is not occupied	Scheme II and scheme III are preferred.
	Construction condition	Relatively good	Relatively good	Relatively good	Equivalent
	Construction difficulty	Large filling volume, relatively large work quantity and relatively long construction period	Relatively few restricted conditions	Relatively large land occupied and construction interference	Scheme II is preferred.
	Construction period	Relatively large work quantity and relatively long construction period	Relatively short construction period	Relatively short construction period	Scheme II and scheme III are preferred.

The middle embankment is basically consistent with the original river channel width. The wall crest elevation is close to the original natural bank slope. The land occupied is moderate. Thus, after comprehensive comparison, the basic embankment distance in the reach is determined as the middle embankment line scheme, in the phase.

(2) Comparison of Embankment Types

For selection of embankment, three types of embankments, i.e. anchor foot + level I slope, anchor foot + level II slope and shelf retaining wall, are compared, and the results are shown in the Table 10-4.

Table 10-4 Comparison of Embankment Types of Dyke in Rongchang Component

Items \ Alternatives		Scheme I is preferred.	Scheme II is preferred.	Scheme III	Merits and Demerits
		Anchor foot + level I slope	Anchor foot + level II slope	shelf retaining wall	
Society	Floor area (m ²)	332,960 (including farmland of 68,420, garden land, flood land, unused land, etc.)	379,579 (including farmland of 77,999, garden land, flood land, unused land, etc.)	390,963 (including farmland of 80,339, garden land, flood land, unused land, etc.)	Scheme I is preferred.

Cost	Investment (RMB)	6840	7864	28017	Scheme I is preferred.
Environment	Landscape ecology	Level I ecological slope protection, and relatively pleasant landscape	Level II ecological slope protection, and best landscape	Upright retaining wall, steep and upright upstream face, and poor landscape	Scheme II is preferred.
	Adjacency to water and safety	Waterfront berm, with better adjacency to water and favorable safety	Waterfront berm, with the best adjacency to water and favorable safety	No adjacency to water	Scheme II is preferred.
Technology	Construction difficulty and construction technology	Convenient construction, routine and mature construction technology, easy to control quality	Convenient construction, routine and mature construction technology, easy to control quality	Convenient construction, routine and mature construction technology, easy to control quality	Equivalent
	Flood flowing of river channel	Flood flowing section of river channel is not occupied	Flood flowing section of river channel is not occupied	Flood flowing section of river channel is occupied	Scheme I and Scheme II are equivalent

It can be found from the above table that anchor foot + level I slope and anchor foot + level II slope have better ecological landscape, but for anchor foot + level II slope, the land occupied and the investment are larger. Meanwhile, for the embankment with shelf retaining wall, the ecological landscape is too poor, and the investment is too large. Thus, the anchor foot + level I slope is the recommended scheme in the phase.

The downstream of the comparison is close to county, the left bank is the concentrated development planning area, and the established embankment in county section is anchor foot + level II slope. In order to echo the established embankment type, anchor foot + level II slope is recommended for the left bank of the downstream of the comparison; and currently, the right bank is village with few residents, so anchor foot + level I slope is mainly recommended.

10.2.1.2 Shizhu Component

(1) Comparison of Route

Scheme I: The local convex bank of the existing river channel shall be cut-off properly, and the embankment line shall be smooth, so as to make the flow condition better. The total length of river channel under treatment is 4171.37 m. New embankment is 4386.76 m long. Ecological revetment is 1179.69 m long. The municipal road on levee crown connects to the surrounding planned road directly (not along the river bank).

Scheme II: The river of the component roughly along northeast to southwest,

meandering in the middle. The flow direction is basically vertical to the attitude of rock stratum. The valley has obvious meander characteristic. The river channel width varies from 60 to 100 m generally. According to the bending at the bend of the river channel, the total length of river channel under training is 5350 m. New embankment is 5962.78 m long. Ecological revetment is 1179.69 m long. The municipal road on levee crown connects to the surrounding planned road indirectly (along the river bank).

Table 10-5 Comparison of Embankment Types of Dyke in Shizhu Component

Items		Alternatives	Scheme I (Recommended Scheme): the Convex Bank of Embankment Line is Straight, and the Municipal road on levee crown is along the River Bank	Scheme II (Alternative Scheme): Embankment Line Selected to be Along the Direction of River Bank, and the Municipal road on levee crown is not along the River Bank	Merits and Demerits
Component	Content		The total length of river channel under treatment is 4171.37 m. New embankment is 4386.76 m long. Ecological revetment is 1,179.69m long. Pipe network is 12.7 km.	The river channel under training is 5,350 m long in total. New embankment is 5,962.78 m long. Ecological revetment is 1,179.69 m long. Pipe network is 12.5 km.	Scheme I is preferred.
Society	Relocation scale (households)		82	100 (including relocation of municipal road)	Scheme I is preferred.
	Floor area (10,000 m ²)		36.67 (including farmland of 8.13)	38.77 (including farmland of 8.51)	Scheme I is preferred.
Cost	Land acquisition cost (RMB 10,000)		1177.78	1277.78	Scheme I is preferred.
	Total investment (RMB 10,000)		1638.36	1771.12	Scheme I is preferred.
Environment	Environmental sensitive site		Hongjing Community, Shuangqing Community, Chengnan Community, Hongxing Village, etc. are surrounded. The involved sensitive site is residents; residential areas are arranged on both sides of the embankment. The distance is 6.5 - 45.6m. The nearest distance away from the sensitive site is relatively far.	Hongjing Community, Shuangqing Community, Chengnan Community, Hongxing Village, etc. are surrounded. The involved sensitive site is residents; residential areas are arranged on both sides of the embankment. The distance is 2.5 - 45.6m. The nearest distance away from the sensitive site is relatively close.	Scheme I is preferred.
	Impact on water and soil loss		The volume of water and soil loss is 4,100 t. Water and soil conservation measures shall be taken to control the water and soil loss. The investment is about RMB 3.45 million.	The volume of water and soil loss is 6,800 t. Water and soil conservation measures shall be taken to control the water and soil loss. The investment is about RMB 7.98 million.	Scheme I is preferred.
Technology	Technical difficulty and feasibility		The amount of earth-rock excavation is 407,700 m ³ . The transportation is convenient and site condition is better.	The amount of earth-rock excavation is 385,600 m ³ . The transportation is convenient and site condition is better.	Scheme II is preferred.
	Flood flowing of river channel		At convex bank, it should be set back as possible while satisfy the requirements for the road on levee crown and the flood passing. In the scheme II, the	Most extends into the river channel at the convex bank, which greatly affect the flood flowing of river channel.	Scheme I is preferred.

Items		Alternatives	Scheme I (Recommended Scheme): the Convex Bank of Embankment Line is Straight, and the Municipal road on levee crown is along the River Bank	Scheme II (Alternative Scheme): Embankment Line Selected to be Along the Direction of River Bank, and the Municipal road on levee crown is not along the River Bank	Merits and Demerits
			flood flowing section is large, which is benefit for flood flowing.		
	Construction condition		Relatively good	Relatively good	Equivalent
	Construction difficulty		New embankment is 5,665.34 m long. In the convex bank, the foundation is relatively high. Filling is not required for the site, which is benefit for construction.	New embankment is 6,243.12 m long. The foundation elevation is relatively low, requiring cofferdam and relatively large work quantity.	Scheme I is preferred.
	Construction period		23 months	25 months	Scheme I is preferred.
Road network planning			Connected to the surrounding planned road indirectly	Connected to the surrounding planned road directly	Scheme II is preferred.
Pipe network planning			Lay by using crest road and municipal road, without new land occupied	Lay by using crest road and municipal road, without new land occupied	Equivalent

Through comparison, the scheme I has the merits as small floor area, small amount of earth-rock excavation, small volume of water and soil loss, relatively far away from the closest sensitive site, low investment, and low construction difficulty, thus, the scheme I is the recommended scheme.

(2) Comparison of Embankment Types

For selection of embankment, three types of embankments, i.e. C20 concrete anchor foot + C20 concrete lattice slope protection (scheme I), gravity retaining wall + lattice turf revetment (scheme II) and shelf retaining wall + lattice turf revetment (scheme III), are compared.

Table 10-6 Comparison of Embankment Types of Dyke in Shizhu Component

Items		Alternatives	Scheme I	Scheme II	Scheme III	Merits and Demerits
			C20 concrete anchor foot + C20 concrete lattice slope protection	Gravity retaining wall + lattice turf revetment	Self retaining wall + lattice turf revetment	
Society	Floor area (m ²)		Equivalent	Equivalent	Equivalent	Equivalent
Cost	Investment (RMB)		6360.16	18019.19	19048.66	Scheme I is preferred.
Environment	Landscape ecology		Good effect	Modest effect	Modest effect	Scheme I is preferred.
	Adjacency to water and safety		Best Adjacency to water and favorable safety	Good Adjacency to water and general safety	Poor Adjacency to water	Scheme I is preferred.
Technology	Construction difficulty and		Relatively low construction	Relatively high construction	Relatively high construction	Scheme I is preferred.

	construction technology	difficulty	difficulty	difficulty	
	Flood flowing of river channel	Flood flowing is not affected.	Flood flowing is not affected.	Flood flowing is not affected.	Equivalent

According to Table 10-6, the scheme I has the following merits as low investment, pleasant landscape, favorable adjacency to water and safety, and low construction difficulty, thus, the scheme I is selected as the recommended scheme.

10.2.1.3 Pengshui Component

(1) Comparison of Route

In order to reduce the effect earthwork volume and environment, for the embankment of Pengshui component, the construction scheme is that perform simple lining for current revetment, scale for the convex section, and backfill effectively for the concave place. According to the actual situation along the route of the component, comparison of schemes shall be performed for the special reach of Cuojiogou section and Xujiaba Site.

① Comparison of Cuojiogou Route

Scheme I: According to the arrangement principle, the embankment line shall backward along the existing bank line as possible. Radius of the arc section of the embankment line is 150 m. The upstream straight line section connected to the arc is about 150 m, and the downstream straight line is about 250 m. In the local reach from Cuojiogou to the entrance of Wujiang River, due to large area of bank bottomland, flood embankment, flood wall + slope revetment are employed for protection; for the other reach with relatively small protection range and relatively gentle gradient, ecological revetment and slope protection are applied to avoid water and soil loss; the reach end is steep mountain, with relatively high elevation. The component measure is not conducted in the section, and shall be connected to other flood control revetment works.

Scheme II: For overall arrangement in the scheme II, except for the section from Cuojiogou to the entrance of Wujiang River, the embankment line arrangement of other reaches is the same as that of the Scheme I.

The section from Cuojiogou to the entrance of Wujiang River: The embankment line is arranged along the backwater dyke of Cuojiogou. The embankment line is about 724 m, including left embankment line of branch gully of 145 m long, and right embankment line of 579 m long; the drainage channel of branch gully is reserved. The left and right embankment lines are connected through a bridge which is 162 m long.

Scheme III: For overall arrangement in the scheme III, except for the section from Cuojiogou to the entrance of Wujiang River, the embankment line arrangement of other reaches is the same as that of the Scheme I. Radius of the arc section of the embankment

line is 350 m. The upstream straight line section connected to the arc is about 50 m, and the downstream straight line is about 155 m.

The section from Cuojiugou to the entrance of Wujiang River: The embankment line is arranged along the river-involved training alignment replied by Changjiang Water Resources Commission. The earth embankment line is about 518 m long. The section of embankment is earth embankment. The drainage box culvert is established at the exit of the branch gully, to maintain its drainage function.

Please refer to Table 10-7 for the results.

Table 10-7 Comparison of Embankment Line Schemes of Dyke Cuojiugou Section in Pengshui Component

Alternatives		Scheme I	Scheme II	Scheme III
Society	Relocation scale due to the component (households)	40	52	35
	Floor area (10,000 m ²)	3.09, including farmland of 2.10	3.97, including farmland of 2.78	2.83, including farmland of 1.89
Cost and benefit	Land acquisition and relocation cost (RMB 10,000)	428.4	548.0	392.0
	Cost of temporary occupation	105.7	109.6	108.2
	Total investment (RMB 10,000)	1965	1794	2497
	Comprehensive benefit = land reclamation benefit – total investment	13785	276	16403
Environment	Environmental sensitive site	15 households	30 households	11 households
	Impact on water and soil loss	The volume of water and soil loss is 7,142 t	The volume of water and soil loss is 7,484t	The volume of water and soil loss is 6,878t
Technology	Technical difficulty and feasibility	Medium	Low	High
	Storage capacity of the occupied river channel (10,000 m ³)	17.7	6.8	23.5, the storage capacity of the occupied river channel exceeds 200,000 m ³ , which can not be approved by the Changjiang Water Resources Commission
	Construction condition	Revetment is through with convenient construction	The bridge must be set in the middle for cut-through, with inconvenient construction	The bridge must be set in the middle for cut-through, with inconvenient construction
	Construction difficulty	Bank line is arranged along the current situation. The work	The embankment line is arranged along the backwater dyke of	Most of bank line extends into the river channel, and the work quantity of

Alternatives		Scheme I	Scheme II	Scheme III
Items		quality of the cofferdam is relatively small.	Cuojigou, requiring no cofferdam.	cofferdam is large.
	Construction period	3	4	3

It can be seen from Table 8-4, in scheme III, the floor area is the smallest, but the storage capacity of the occupied river channel exceeds 200,000 m³, which can not be approved by the Changjiang Water Resources Commission. The construction difficulty is high, so the scheme III is infeasible; in scheme II, the storage capacity of the occupied river channel is the smallest, but the floor area is the largest, and the land reclamation area is the smallest. Therefore, after comprehensive comparison of indicators, the scheme I is recommended for the flood control revetment works in the phase.

② Comparison of Routes of Dyke in Xujiaba Site

Xujiaba site on the left bank: It is a convex bank and in the shape of half ellipse, starting from the downstream of Chongqing-Huaihua Railway Bridge on the left bank of Wujiang River, and ending in Xigou; the reach is about 700 m in total. Xujiaba site is located along the bank, and dwellings are located at inner side. Along the bank, the current slope elevation is 233 – 235 m, and the current elevations of dwellings exceed 239 m. This is an open terrace, with Shuijinggou and Xigou on both sides. For the bottom of Shuijinggou, the current elevation is 216.8 m, the width is about 67 m, and the depth is 8.3 m; and for the bottom of Xigou, the current elevation is 205.7 m, the width is 126.88 m, and the depth is 19.8 m.

Scheme I: The embankment line is arranged along the existing bank line, in combined with the elevation of slope along the line, less land in Xujiaba site shall be occupied as possible. In the entrance of Shuijinggou and Xigou, the box culvert shall be set to maintain the drainage capacity of branch gullies.

Scheme II: According to the landform and geology of the section, and the boundary of cultural relics protection zone, slope faced revetment type is set between 2m of the boundary of cultural relics protection zone and the full supply level of 215 m so as to avoiding occupying the cultural relics protection zone. The drainage channels of branch gully are reserved, the embankment line in the section from branch gully to the entrance of Wujiang River is arranged along the backwater dyke of Shuijinggou and Xigou.

Please refer to Table 10-8 for the results.

Table 10-8 Comparison of Embankment Line Schemes of Dyke in Xujiaba Site in Rongchang Component

Alternatives		Scheme I	Scheme II
Items	Relocation scale due to the component (households)	43	30
	Floor area (10,000 m ²)	3.29, including farmland of 2.29	2.24, including farmland of 1.56
Cost and	Land acquisition and relocation cost	415.5	318.44

benefit	(RMB 10,000)		
	Cost of temporary occupation	83.1	82.5
	Total investment (RMB 10,000)	1263	1325
Environment	Impact and protection role for Xujiaba site	The excavated area in Xujiaba site has been occupied. The flood control revetment works meet the 20 year-return standard, which can protect other non-excavated area on the site.	The elevation of revetment is only about 220 m, lower than the 20 year-return design flood level, which can hardly protect the cultural relics.
	Impact on water and soil loss	The volume of water and soil loss is 7,142 t	The volume of water and soil loss is 7,657t
Technology	Technical difficulty and feasibility	Technology is mature and feasible	It is feasible. But there is difference between elevations of the section and other sections, and the road and pipeline arrangement is very difficult, and can not meet the 20 year-return flood control standard.
	Storage capacity of the occupied river channel (10,000 m ³)	0	0
	Construction condition	Revetment and road are through with convenient construction	Construction is inconvenient, with lack of construction road and inconvenient construction operation, requiring other temporary road, which has affected the cultural relics and historic sites.
	Construction difficulty	The bank line arrangement is relatively straight. Construction road is arranged continently. Embankment body and foundation are overlapped, so the construction difficulty for road and pipeline arrangement will be low.	Simple lining is performed for the existing bank line, with lack of construction road and inconvenient construction operation, requiring other temporary road. The elevation of revetment is only about 220 m, lower than other sections (over 235 m). The construction difficulty for road and pipeline arrangement is high, because crossing the entrance of branch gully shall be considered. Construction difficulty is high.
	Construction period (month)	4	5

Due to dual impact of natural and human factors, bank slopes of Xujiaba site are found with collapse and water & soil erosion. Scheme I can protect the site from flooding, and the occupied site has been excavated, which has small impact on the archaeological value of the site; the scheme II can not meet the 10-year flood return standard because of the limit on the site and river channel, and can not protect the site as predicted, because the road and sewage pipe network construction difficulty is high. Thus, in general, the scheme I is recommended.

(2) Comparison of Embankment Types

For selection of embankment, two types of embankments, i.e. earth embankment +

slope revetment (scheme I), and upright retaining wall + slope revetment (scheme II), are compared. The comparison results are shown in Table 10-9.

Table 10-9 Comparison of Embankment Types of Dyke in Pengshui Component

Items \ Alternatives		Scheme I (Recommended Scheme): Earth Embankment + Slope Revetment	Scheme II (Comprised Scheme): Upright Retaining Wall + Slope Revetment
Society	Floor area (10,000 m ²)	36.23	26.99
Cost	Investment (RMB 10,000)	16531	39027
Environment	Landscape ecology	The landscape of slope protection is pleasant.	The landscape of slope protection is general.
	Adjacency to water	People can contact the river directly, adjacency to water is good.	People can not contact the river directly, adjacency to water is poor.
Technology	Construction difficulty and construction technology	Simple construction without foundation excavation, requiring no cofferdam.	Complex construction with large amount of foundation excavation, requiring cofferdam.
	Flood flowing of river channel	Smooth flood flowing of river channel, and good state of flow	Relatively smooth flood flowing of river channel, and relatively poor state of flow

According to the Table 10-9, the construction type in the scheme I (earth embankment + slope revetment) has the following merits as simple construction, low investment, pleasant landscape, favorable adjacency to water, smooth flood flowing of river channel, and good state of flow, thus, the scheme I (earth embankment + slope revetment) is recommended in the phase.

10.2.1.4 Tongnan Component

(1) Comparison of embankment line strikes

Embankment lines should be arranged based on following principles, i.e. ensuring flood flowing and discharge safety, minimizing the land occupation due to project and adverse impacts of project construction on the environment, maximizing the scope of flood control, combining flood control with drainage, as well as the flood control and drainage facilities with urban construction and development. According to current landform conditions, as for three sections of embankment lines, both internal line scheme and external line scheme were selected for comparison.

① Comparison of lines for embankment section I

As for the terrain, multi-step bench land currently dominates embankment section I. From river to the bank, there are 4 steps, with elevation respectively 241.0m, 243.0m, 247.0m and 250.0m. Scheme comparison is carried out from aspects of society, costs,

environment, technology, visual effect etc. Dingming Mountain–Canal Scenic Spot, Fujiang River National Wetland Park, drinking water conservation district and Tongnan Giant Buddha Temple are not involved in embankment section I.

Embankment section I is 1.8km long, located at upstream starting part, (starting from the Stake with No. of DaRight 0+000 at the outer wall of pump station management area in the upstream Hongyanzui irrigation area to the Stake with No. of DaRight 1+800 in Group One of Xinsheng Village); the middle section is a 1.8km-long revetment section (starting from the Stake with No. of DaRight 1+800 in Group One OF Xinsheng Village to the Stake with No. of DaRight 3+600 in the west of Group Three of Qianjin Village); embankment section II connects the end, (starting from the Stake with No. of DaRight 3+600 in the west of Group Three of Qianjin Village to the Stake with No. of DaRight 6+840 beside the road at left bank of Shengli Channel in Group One of Shengli Village), with a length of 3.24km.

Table 10-10 Comparison of Schemes Selected for the Embankment Section I of the Dyke of Tongnan Component

Items		Options	Scheme I (Recommended): Internal Line Scheme	Scheme II (Alternative): External Line Scheme	Scheme III (Alternative): Revetment Scheme	Merits and Demerits
			Length (Km)	1.8	1.81	
Society	Relocation scale (households)		None	None	None	Equivalent
	Floor area (10,000 m ²)		8.55 (7.20 is farmland and the other is unutilized land.)	9.50 (7.35 is farmland and the other is unutilized land.)	6.21 (5.34 is farmland and the other is unutilized land.)	Scheme III is preferred.
	Added protected land area		203	293	0	Scheme II is preferred.
Cost	Land acquisition cost (unit: RMB 10,000)		916	1483	605	Scheme I is preferred.
	Total investment (unit: RMB 10,000)		3267	4605	1693	Scheme III is preferred.
	Operating cost (RMB 10,000/year)		309.2	309.2	309.2	Equivalent
Environment	Environmental sensitive site	Huangjiaotang spawning ground and Xibutang spawning ground	Since it is relatively far away from Huangjiaotang and Xibutang spawning grounds, the impact of construction noise is less.	Since it is relatively close to Huangjiaotang and Xibutang spawning grounds, the impact of construction noise is greater.	Since it is relatively close to Huangjiaotang and Xibutang spawning grounds, the impact of construction noise is greater.	Scheme I is preferred.
	Visual effect		It is set back by 50m with respect to the external line scheme to reserve a larger space for construction of a green ecological corridor, which can bring great social benefits.	It is close to the outer river. After the embankment is completed, the residual area of bench land is relatively small, thus the creation of a wetland landscape is not so successful.	Since the landscape area is too small, it is worse than the internal line scheme.	Scheme I is preferred.

	Impact on flood flowing	The impact on the flood surface profile of Fujiang River is relatively small. But the flood flowing section is 50m wider than that in the external line scheme which is more conducive to flood flowing.	The impact on the flood surface profile of Fujiang River is relatively small.	The impact on the flood surface profile of Fujiang River is relatively small.	Scheme I is preferred.
	Impact on water and soil loss	The amount of earth and rock excavation and backfill is relatively small. The amount of water and soil loss is 1923t. Soil and water conservation measures are required to prevent and control the loss.	The amount of earth and rock excavation and backfill is relatively large. The amount of water and soil loss is 2,135t. Soil and water conservation measures are required to prevent and control the loss.	The amount of earth and rock excavation and backfill is relatively small. The amount of water and soil loss is 1,400t. Soil and water conservation measures are required to prevent and control the loss.	Scheme I is preferred.
Technology	Technical difficulty and feasibility	The plant site is near the water resource and 2.2km away from the transformer station, connected with S205, Dafu Road etc. via access road. The transportation is convenient and the construction conditions are relatively good.	The plant site is near the water resource and 2.2km away from the transformer station, connected with S205, Dafu Road etc. via access road. The transportation is convenient and the construction conditions are relatively good.	The plant site is near the water resource and 2.2km away from the transformer station, connected with S205, Dafu Road etc. via access road. The transportation is convenient and the construction conditions are relatively good.	Equivalent
	Construction condition	Relatively good	Relatively good	Slightly unfavorable	Equivalent
	Construction difficulty	The construction is not affected by the storm water. No diversion or closure measure is required for construction.	The construction is not affected by the storm water. No diversion or closure measure is required for construction.	The construction is not affected by the storm water. No diversion or closure measure is required for construction.	Equivalent
	Construction period	Small earth and rock volume and relatively short construction period	Relatively large earth volume and relatively long construction period	Relatively long revetment and relatively long construction period	Scheme I is preferred.

In the internal line scheme for section I of the Project, the floor area and investment are moderate; the length is relatively short; the protected lands are more; the visual effect created is better; it is more conducive to flood flowing of the river; since it is farthest away from Huangjiaotang spawning ground, the impact of the construction on the Huangjiaotang spawning ground is relatively small.

② Comparison of embankment lines for revetment section

This section is relatively high, generally higher than the 20-year flood line. The middle-upper part of the bank slope is relatively steep, with a gradient about $35^{\circ} \sim 50^{\circ}$ and about 7m~11m high. The middle-lower part is mild slope, generally with a gradient of $15^{\circ} \sim 30^{\circ}$. Scheme comparison is carried out from aspects of society, costs, environment, technology, visual effect etc. Fujiang River National Wetland Park, drinking water conservation district and Tongnan Giant Buddha Temple are not involved in revetment section. For detailed comparison results, refer to Table 10-11.

Table 10-11 Comparison of Schemes for the Revetment Section of the Dyke of Tongnan
Component

Items		Alternatives	Scheme I (Alternative): Internal Line Scheme	Scheme II (Recommended): External Line Scheme	Merits and Demerits
		Length	1.73	1.80	Scheme I is preferred.
Society		Relocation scale (households)	Four households; schools are also affected.	0	Scheme II is preferred.
		Floor area (10,000 m ²)	17.24 (11.81 is farmland and the other is unutilized land.)	12.32 (8.44 is farmland and the other is unutilized land.)	Scheme II is preferred.
		Added protected land area (10,000 m ²)	0	3.34	Scheme II is preferred.
Cost		Land acquisition cost (unit: RMB 10,000)	1880.3	1200	Scheme II is preferred.
		Total investment (unit: RMB 10,000)	4980.4	3416	Scheme II is preferred.
		Operating cost (RMB 10,000/year)	309.2	309.2	Equivalent
Environment	Environmental sensitive site	Xibutang spawning ground	Since it is relatively far away from Xibutang spawning ground, the impact is small.	Since it is relatively far away from Xibutang spawning ground, the impact is small.	Equivalent
		No.4 community of Xinsheng Village	Since it is relatively close to No.4 community of Xinsheng Village, the construction impact is relatively large.	Since it is relatively far away from No.4 community of Xinsheng Village, the construction impact is relatively small.	Scheme II is preferred.
		Dingming Mountain-Canal Scenic Spot	Within the scenic spot	Within the scenic spot	Equivalent
	Visual effect		It is wider at the side near the river. The visual effect is better.	It is worse than the internal line scheme.	Scheme I is preferred.
	Impact on flood flowing		The impact on the flood surface profile of Fujiang River is relatively small. But the flood flowing section is wider than that in the external line scheme, which is more conducive to flood flowing.	Flood flowing section is not narrowed and flood flowing is basically not affected.	Scheme I is preferred.
	Impact on water and soil loss		The amount of earth and rock excavation and backfill is relatively large. The amount of water and soil loss is 3,870t. Soil and water conservation	The amount of earth and rock excavation and backfill is relatively small. The amount of water and soil loss is 2,770t. Soil and water conservation	Scheme II is preferred.

		measures are required to prevent and control the loss.	measures are required to prevent and control the loss.	
Technology	Technical difficulty and feasibility	The plant site is near the water resource and 2.2km away from the transformer station, connected with S205, Dafu Road etc. via access road. The transportation is convenient and the construction conditions are relatively good.	The plant site is near the water resource and 2.2km away from the transformer station, connected with S205, Dafu Road etc. via access road. The transportation is convenient and the construction conditions are relatively good.	Equivalent
	Construction condition	Relatively good	Relatively good	Equivalent
	Construction difficulty	The construction is not affected by the storm water. No diversion or closure measure is required for construction.	The construction is not affected by the storm water. No diversion or closure measure is required for construction.	Equivalent
	Construction period	Relatively large earth and rock volume and relatively long construction period	Relatively small earth volume and relatively short construction period	The external line scheme is preferred.

In the internal line scheme (scheme I), the revetment section is 1.73km, 1.80km in the external line scheme (scheme II). Main distinctions between the two schemes are impacts on project investment and compensation for land occupation. Since extension towards the bank occurs in the internal line scheme, earth excavation volume is far more than that in the external line scheme. In addition, as a result of the internal line scheme, most houses in Group One of Xincheng Village and Tongnan Culture and Martial Art School in Tongnan County are affected. Compared with the external line scheme, more farmland is occupied. The external line scheme would not narrow flood flowing section, and can make construction basically keep away from houses and make full use of flood land, as well as have 33,400 m² added protected land area.

To sum up, the external line scheme (scheme II) has obvious advantages and is selected as the scheme for revetment section.

③ Comparison of lines for embankment section II

As for the terrain, multi-step bench land currently dominates embankment section II. From river to the bank, there are 3 steps, with elevation respectively 235.0m, 240.0m and 245.0m. According to the 20-year flood control standards, the top of embankment in this section is about 248.0m high. According to the topography, an embankment should be constructed. Analysis of line selection for embankment section II is divided into two sections.

A. Selection of embankment line on the lower reach of Jinfo Bridge

a: On condition that it would not affect flood flowing, the embankment line should be arranged along the elevation of 245.0m and be kept away from houses as far as possible.

According to planning of Giant Buddha Temple Scenic Spot, the area from Jinfo Bridge to Giant Buddha Temple on the right bank of Fujiang River below 245m has been classified into the land for the planning of Scenic Spot. The area has been selected for construction of a waterfront leisure park with beach. To reduce impacts of embankment construction on houses in Group One of Shengli Village, on condition that it would not affect flood flowing, the embankment line within scenic spots should be arranged along the elevation of 245.0m and be kept away from houses as far as possible.

b: Determination of embankment end

Determination of embankment end is affected by Shengli Weir and Giant Buddha Temple scenic spot.

★ The end is arranged across the Shengli Channel, flood blocking and drainage sluice would be required at the channel-crossing area. Operation management would be more complicated, the investment would be higher and the embankment and sluice arranged within the scenic spot would affect natural landscape in the scenic spot.

★ According to the *Detailed Plan for Control of the Giant Buddha Temple Area*, the area on both sides of Shengli Weir on the lower reach of Yang shangkun Cemetery is for the planning of Giant Buddha Temple area. According to the planning results, the riverbed below 10-year flood level is the main flood flowing zone; the land above 10-year flood level and below 20-year flood level is the area restricted for use. Within the area restricted for use it is forbidden to construct structures that influence flood flowing. No structure is constructed except for outdoor theater. Only vegetative landscape is used for decoration. Therefore, according to its importance, no defense is required along Shengli Weir, maintaining the natural state of the river.

★ According to the *Overall Planning of Dingming Mountain–Canal Scenic Spot*, Shengli Weir is the boundary of core scenic spot of Giant Buddha Temple, south side of which is within the core scenic spot. It is specified in the *Planning* that any construction irrelevant to resources protection is forbidden in the core scenic spot and construction of various structures is strictly forbidden. It does not meet requirements of the *Overall Planning* and violates *Regulations on Scenic and Historic Areas* to construct embankment in the core scenic spot of Giant Buddha Temple.

According to above three factors, the proposed end will not be arranged across Shengli Channel. The end will be set beside the road at left bank of Shengli Channel in Group One of Shengli Village.

c: Comparison of embankment lines for embankment section on the left bank of Shengli Channel close to the exit of Fujiang River

There are two proposed schemes, i.e. arrangement of embankment close to Shengli Channel and arrangement of embankment line on the highland on the left bank of Shengli Channel. For comparison of the two schemes, refer to Table 10-12.

Table 10-12 Comparison of Embankment Lines for Embankment Section on the Left Bank Close to the Exit of Fujiang River of Shengli Channel of Tongnan Component

Alternatives Items	Located Close to Shengli Channel	Located on the Highland on the Left Bank of Shengli Channel
Embankment type	Concrete retaining wall and concrete revetment	Slope embankment
Landscape resource	The Visual effect is poor due to large area of exposed concrete.	As for the slope embankment, the visual effect is good with turf and landscaping vegetation planted on bank slope of embankment with mild slope.
Geological characteristics	The bottom of Shengli Channel is at the elevation of 232m, with steep slopes, deep ditches.	The ground elevation is 247m. The required height of embankment is just 1m.
Construction difficulty	The work quantity is large, with complex structure.	The work quantity is small, with simple structure.
Treatment of the bridge at Shengli Weir	Reconstruction of the bridge at Shengli Weir	Unchanged
Project investment	13131(unit: RMB 10,000) (including 324 of bridge reconstruction investment)	12081 (unit: RMB 10,000)

In general, the embankment section in the left bank of Shengli Channel close to the exit of Fujiang River is arranged at highland in left bank of Shengli Channel. Due to waterlogging of some riverside areas in Shengli Village Group 1 caused by construction of the embankment, temporary open drainage ditch needs to be provided for automatic drainage of hydrops in drainage area before laying urban drainage network. In consideration of this section of embankment line crossing road in the village, so another road would be reserved in the section. Temporary drainage ditches are provided at both sides of the road for automatic flood drainage.

B. Embankment section on the upper reach of Jinfo Bridge

About 2.2km embankment line on the upper reach of Jinfo Bridge should be arc so that the revetment section can be smoothly connected with embankment line in scenic spot. For this section of embankment line, internal line scheme and external line scheme are selected for comparison based on topography and flood flowing conditions.

In the external line scheme, in order to reach critical position of the smallest flood flowing section, flood land can be utilized to the largest extent and translated to urban land. In the internal line scheme, starting and end points overlap with that in the external line scheme, and the middle section is 50m nearer to the bank. See Table 10-13 for detailed comparison of schemes.

Table 10-13 Comparison of Schemes Selected for the Embankment Section II of the Dyke of Tongnan Component

Items		Alternatives	Scheme I (Recommended): Internal Line Scheme	Scheme II (Alternative): External Line Scheme	Merits and Demerits
		Length (km)	3.24	3.32	The internal line is a little short.
Society	Relocation scale (households)		None	None	Equivalent
	Floor area (10,000 m ²)		22.35 (14.94 is farmland and the other is unutilized land.)	33.58 (22.45 is farmland and the other is unutilized land.)	Scheme I is preferred.
	Added protected land area (10,000 m ²)		0	3.74	Scheme II is preferred.
Cost	Land acquisition cost (unit: RMB 10,000)		2243	4241	Scheme I is preferred.
	Total investment (unit: RMB 10,000)		7513	12455	Scheme I is preferred.
	Operating cost (RMB 10,000/year)		309.2	309.2	Equivalent
Environment	Environmental sensitive site	Dingming Mountain–Canal Scenic Spot	99% within the scenic spot	99.2% within the scenic spot	Scheme I is preferred.
		Fujiang River National Wetland Park	Not involved	Not involved	Equivalent
		Xibutang spawning ground	Since it is relatively far away from Xibutang spawning ground, the impact of construction noise is less.	Since it is relatively close to Xibutang spawning ground, the impact of construction noise is less.	Scheme I is preferred.
		Tongnan Giant Buddha Temple-national key cultural relics protection site	Since it is about 500m away from core scenic spot of Giant Buddha Temple, the impact is small.	Since it is about 500m away from core scenic spot of Giant Buddha Temple, the impact is small.	Equivalent
		Standby water intake for drinking water source at the Fujiang River for Tongnan urban area	The tail of the toe near the river is about 250m, located within the land area of Class A protection zone of drinking water source.	The tail of the toe near the river is about 250m, located within the land area of Class A protection zone of drinking water source.	Equivalent
		Visual effect	It is set back by 50m with respect to the external line scheme to reserve a larger space for construction of a green ecological corridor, which can bring great social benefits.	It is close to the outer river. After the embankment is completed, the residual area of bench land is relatively small, thus the creation of a wetland landscape is not so successful.	Scheme I is preferred.
		Impact on flood flowing	The impact on the flood surface profile of Fujiang River is relatively small. But the flood flowing section is 50m wider than that in the external line scheme, which is more conducive to flood flowing.	The impact on the flood surface profile of Fujiang River is relatively small.	Scheme I is preferred.
		Impact on water and soil loss	The amount of earth and rock	The amount of earth and rock	Scheme I is

Alternatives		Scheme I (Recommended): Internal Line Scheme	Scheme II (Alternative): External Line Scheme	Merits and Demerits
Items		excavation and backfill is relatively small. The amount of water and soil loss is 5,017t. Soil and water conservation measures are required to prevent and control the loss.	excavation and backfill is relatively large. The amount of water and soil loss is 7,525t. Soil and water conservation measures are required to prevent and control the loss.	preferred.
Technology	Technical difficulty and feasibility	The plant site is near the water resource and 2.2km away from the transformer station, connected with S205, Dafu Road etc. via access road. The transportation is convenient and the construction conditions are relatively good.	The plant site is near the water resource and 2.2km away from the transformer station, connected with S205, Dafu Road etc. via access road. The transportation is convenient and the construction conditions are relatively good.	Equivalent
	Construction condition	Relatively good	Relatively good	Equivalent
	Construction difficulty	The construction is not affected by the storm water. No diversion or closure measure is required for construction.	The construction is not affected by the storm water. No diversion or closure measure is required for construction.	Equivalent
	Construction period	Small earth and rock volume and relatively short construction period	Relatively large earth volume and relatively long construction period	Scheme I is preferred.

Through comparison of the above schemes, the internal line scheme is preferred in terms of flood flowing of Fujiang River, and difference between these two schemes is small in terms of construction difficulty; the internal line scheme is RMB 49,420,000 cheaper than the external line scheme in terms of land occupancy and investment analysis of the works. Meanwhile, based on analysis for visual effect, in the internal line scheme, there is more vacant land for waterfront landscape planning. In addition, in the internal line scheme, the embankment line is farther to Xibutang Spawning Ground and would exert slighter impact. Through comprehensive analysis, the internal line scheme is adopted for arrangement of the embankment section II.

(2) Comparison of Embankment Types

① Comparison of Embankment Types of Embankment Sections I and II

The embankment section I is located at starting point of the upper reach of embankment line, with length of 1.80km. It belongs to flood land with mild slope. Surface layer of embankment toe line is formed by silt with thickness of about 2.5m. Levee body is covered with silt with thickness of more than 5.0m. Sandy gravels with high bearing capacity is placed under the silt. The embankment is about 6m high. The topography and geological conditions of embankment section II are basically identical to that of the embankment section I. The embankment section II is about 7.5m high. The schemes of anti-flood wall embankment and slope embankment are compared. See Table 10-14 for the results.

Table 10-14 Comparison of Schemes for the Embankment of the Dyke of Tongnan Component

S/N	Item	Unit	Embankment Section I		Embankment Section II	
			Slope Embankment	Anti-Flood Wall Embankment	Slope Embankment	Anti-Flood Wall Embankment
Cost	Investment	RMB 10,000	3267	3593	7513	7714
Environment	Landscape ecology		Area of exposed concrete outside the embankment is small, the slope is long and the landscape is pleasant	Area of exposed concrete outside the embankment is large, the slope is short and the landscape effect is poor	Area of exposed concrete outside the embankment is small, the slope is long and the landscape is pleasant	Area of exposed concrete outside the embankment is large, the slope is short and the landscape effect is poor
	Adjacency to water and safety		Adjacency to water and safety are good	Adjacency to water and safety are lower than that of slope embankment	Adjacency to water and safety are good	Adjacency to water and safety are lower than that of slope embankment
Technology	Construction difficulty and construction technology		The work quantity is small, with simple structure.	The work quantity is large, with complex structure.	The work quantity is small, with simple structure.	The work quantity is large, with complex structure.
	Flood flowing of river channel		With small difference	With small difference	With small difference	With small difference
Land occupancy and quantity of works	Earth excavation	m ³	96929	101266	263157	332344
	Earth-rock backfilling	m ³	185341	142587	549082	336297
	Concrete	m ³	24301	41515	39059	81939
	Reinforcement	t	13	13	25	25
	Cost for land acquisition and resettlement	RMB 10,000	916	812	2243	1646

See Table 3.3-2 for quantity of works and investment of slope embankment and anti-flood wall embankment. The investment of the slope embankment is cheaper than that of the anti-flood wall embankment, because the slope embankment is characterized by the advantages of using local materials, convenient construction, saving money, short construction period, convenience for greening and landscaping. The anti-flood wall embankment has higher investment and poorer adjacency to water. Besides, due to large area of exposed concrete on the embankment surface, it is difficult to adhere to the idea of integrating human and the nature all the time.

Through comprehensive comparison, the slope embankment is recommended at this stage.

② Comparison of types of revetment section

The revetment section is located in the middle section of the embankment line, with length of 1.8km. This section is relatively high, generally higher than the 20-year flood line. The middle-upper part of the bank slope is relatively steep, with a gradient of about 35°~50° and a height of about 7m~11m. The middle-lower part is mild slope, generally with a gradient of 15°~30°. Some parts of the existing bank slope is instable, requiring slope cutting and stress release or protection treatment.

Schemes are compared based on flood surface profile of Fujiang River, construction difficulty, visual effect, impact on vegetation and school, scope of land occupancy, investment of works etc. See Table 10-15 for details.

Table 10-15 Comparison of Embankments in the Revetment Section of the Dyke of Tongnan Component

Alternatives		Scaling Type Revetment	Anti-Flood Wall + Slope Revetment
Items			
Impact on flood surface profile of Fujiang River		With slight impact and small difference	With slight impact and small difference
Construction difficulty		The construction is not affected by the storm water. No diversion or closure measure is required for construction.	The construction is not affected by the storm water. No diversion or closure measure is required for construction.
Visual effect		Area of exposed concrete outside the embankment is large and the slope is short.	Area of exposed concrete outside the embankment is small and the slope is long.
Impact on natural vegetation		Earth-rock excavation volume is large, exerting severe impact on natural vegetation.	Earth-rock excavation volume is small, exerting slight impact on natural vegetation.
Impact on Wenwu School		The slope top is close to the school, which probably affects safety of school buildings during construction of embankment.	Basically no impact.
Cost for land acquisition and resettlement		2244 (involving higher cost and more land acquisition)	2093 (involving lower cost)
Project investment	Earth excavation (m ³)	225886 (very large)	162361 (large)
	Earth-rock backfilling (m ³)	136898 (very large)	112221 (large)
	Concrete	32530	42964
	Reinforcement	13	13
	Investment in civil construction and resettlement (RMB 10,000)	5037	5031

Through comprehensive comparison, the embankment with anti-flood wall + slope revetment is recommended at this stage.

10.2.2 Comparison of Schemes for Sewage collection and treatment Works

(1) Rongchang Component

① Comparison of Schemes for Sewage Collection and Treatment

Scheme I: building a new sewage collection and treatment plant (design capacity: 12,000m³/d for short term and 40,000m³/d for long term)

It is planned to build a new sewage collection and treatment plant at a place nearby Erlangtan Bridge, with a distance of more than 3km to upstream of Shabu water intake. According to content of Laixi River Integrated improvement Works, total 8.42km sewage pipe network needs to be constructed (its upper reach starts at the family surnamed Zhao, 1,155m from the upper reach of Darong Ancient Bridge in Lukong Town in the north and extends to the Erlangtan Bridge in the south, with total length of about 4.85km; its lower reach starts at Shabu in the north and extends to the existing wastewater interception main at the Liansheng Bridge, with total length of about 3.57km). All pipes belong to gravity flow pipeline, and no such facilities as pump station are required. Total investment of the scheme is about RMB 21,600,000.

Scheme II: wastewater pump station + pipe network (wastewater is discharged into Rongchang Urban Sewage collection and treatment Plant. The design capacity is 25,000m³/d and the surplus capacity is 10,000m³/d)

Starting at the family surnamed Zhao, 1,155m from the upper reach of Lukong Town in the north and extending to the sewage pipe network for Rongfeng River at the Liansheng Bridge in the south, total 12.41km sewage pipe network needs to be constructed (including 4.85km gravity flow pipeline from the family surnamed Zhao, which is 1,155m from the upper reach of Lukong Town to the Erlangtan Bridge, 3.99km pressure flow pipeline from the Erlangtan Bridge to Shabu, and 3.57km gravity flow pipeline from Shabu to the existing wastewater interception main at the Liansheng Bridge). Besides, a new lift pump station needs to be constructed, which is located at about 300m away from the upper reach of the Erlangtan Bridge. Wastewater is discharged into the existing Rongchang Urban Sewage collection and treatment Plant for treatment (with capacity of 25,000m³/d). Total investment of the scheme is about RMB 13,420,000.

Scheme III: expanding the existing Lukong Sewage collection and treatment Plant (the present capacity is 350m³/d) + wastewater pump station + sewage pipe network

Starting at the family surnamed Zhao, 1,155m from the upper reach of Lukong Town in the north and extending to the sewage pipe network for Rongfeng River at the Liansheng Bridge in the south. Capacity of the original Lukong Sewage collection and treatment Plant, i.e. 350m³/d, is expanded to 9500m³/d for collection of wastewater in area A. An

intermediate lift pump with long-term lifting capacity of 2000m³/d is constructed at about 400m away from the lower reach of the Erlangtan Bridge. The lift pump is used for collection of wastewater in area B, and the wastewater is carried with pressure pipeline to Shabu, and then sewage pipe network is constructed to collect wastewater in area C. After that, sewage pipe network is constructed along the flow direction of river to collect wastewater in area D. Eventually, all the wastewater is discharged to the existing wastewater interception main in Rongchang County.

In this scheme, total 12.0km sewage pipe network (including 3.1km gravity flow pipeline for collection of wastewater in area A; 0.4km gravity flow pipeline for collection of wastewater in area B and 4.0km pressure flow pipeline extending from the Erlangtan Bridge to Shabu where wastewater cannot be collected; 4.0km gravity flow pipeline for collection of wastewater in areas C and D) needs to be constructed. 0.6 km gravity flow pipeline is required for collection of wastewater in area Élan old Lukong Sewage collection and treatment Plant is expanded and a new lift pump station is constructed at about 400m away from the lower reach of the Erlangtan Bridge, with long-term lifting capacity of 2000m³/d and short-term lifting capacity of 1200m³/d (collecting wastewater in area B). Total investment of the scheme is about RMB 27,896,300.

See Table 10-16 for the comparison of pipe network schemes of the Project.

Table 10-16 Comparison of Schemes for Sewage collection and treatment Works of Rongchang Component

Items		Alternatives		Result	
		Scheme I (for Comparison and Selection)	Scheme II (for Recommendation)		Scheme III (for Comparison and Selection)
		New sewage collection and treatment plant	Wastewater pump station + pipe network scheme	Expanded sewage collection and treatment plant + wastewater pump station + wastewater pipe network	
Social aspect	Relocation scale (households)	15 households	None	10 households	Scheme II is preferred.
	Occupied area (m ²)	12000	420	11000	Scheme II is preferred.
Cost	Total investment (RMB 10,000)	2160	1342	2789.63	Scheme II is preferred.
Environmental aspect	Environmental sensitive site	32 residents of 10 households are influenced by atmospheric pollution and noise generated during the project construction and operation periods.	17 residents of 5 households are influenced by atmospheric pollution and noise generated during the project construction and operation periods.	28 residents of 8 households are influenced by atmospheric pollution and noise generated during the project construction and operation periods.	Scheme II is preferred.

	Pollution source increased or not	The operating equipment of the new sewage collection and treatment plant has relatively large impact on the environment.	The wastewater lift pump has relatively small impact on the environment.	The operating equipment of the new sewage collection and treatment plant has relatively large impact.	Scheme II is preferred.
	Impact on water and soil loss	The amount of water and soil loss is 83.46t/a and investment in water and soil conservation is about RMB 1.8 million.	The amount of water and soil loss is 19.8t/a and investment in water and soil conservation is about RMB 200,000.	The amount of water and soil loss is 75.8t/a and investment in water and soil conservation is about RMB 1.2 million.	Scheme II is preferred.
Technology	Technical difficulty and feasibility	The transportation conditions are convenient about 100m from Rongchang to the road junction; the construction conditions are relatively good, but relocation is involved.	The transportation conditions are convenient and the construction conditions are relatively good.	The area of acquired land is not enough.	Scheme II is preferred.
	Construction conditions	Relatively good	Relatively good	Relatively good	Equivalent
	Construction difficulty	Demolition and resettlement issues	Demolition is not involved; there is little difficulty in construction; the construction conditions are good.	The area of acquired land is not enough.	Scheme II is preferred.
	Construction period	The construction period of plant location is relatively long.	The construction period is relatively short.	The construction period is relatively long.	Scheme II is preferred.
	Difficulty in management	The operation system of the sewage collection and treatment plant is relatively complicated and it is relatively difficult to manage operation.	The operation system is simple; it operates automatically and only needs personnel on duty for monitoring; it is relatively easy to manage operation.	It is difficult to manage operation.	Scheme II is preferred.

After analysis and comparison, Scheme II is recommended as the proposed scheme for the component as it has small impacts on the environment, small construction difficulties, and low construction costs.

② Comparison of sewage pipeline schemes

Scheme I: The sewage conduits are arranged in line with the embankment along the right bank of Laixi River for sewage collection along the right bank, and the sewage along the left bank is collected by lateral sewers and connected by means of inverted siphon to the sewage conduits of the right bank.

Scheme II: The sewage conduits are arranged in line with the embankment along the left bank of Laixi River for sewage collection along the left bank, and the sewage along the

right bank is collected by lateral sewers and connected by means of inverted siphon to the sewage conduits of the left bank.

The sewage pipe network works starts at the old house of the family surnamed Zhao, 1,155m from the upper reach of Darong Ancient Bridge in Lukong Ancient Town, and connects at its end with main pipe of current sewage pipe network for Rongfeng River at the Liansheng Bridge. Approximately 13.4 km new sewage pipe network is required.

The sewage pipe network is arranged basically in the direction of the dyke. The sewage pipe network is divided into three sections. The first section where gravity flow pipe is adopted starts at the sewage booster pump station, 300m from upper reach of Erlangtan Bridge, and arranged along the left river bank. The second section where pressure flow pipe is adopted starts from the sewage booster pump station to the highest point of Shabao highway, and arranged along the highway from Lukong Town to Rongchang County. The third section where gravity flow pipe is adopted starts from the highest point of Shabao highway to Liansheng Bridge, and arranged along the left river bank, and connects at Liansheng Bridge with the existing sewage pipe network in the urban area. Refer to Attachment 5.

This sewage pipe network mainly collects the domestic sewage of residents along the embankment. At present, the domestic sewage of residents in Lukong Town is collected for treatment in Lukong Wastewater Treatment Plant and discharged after reaching standard. Thanks to the development of Lukong Town, Lukong Wastewater Treatment Plant is unable to meet the development requirements any more. According to the drainage planning, the sewage in the long term will be collected into this sewage pipe network and then delivered to the wastewater treatment plant in the urban area for treatment.

At the same time, the urban sewage pipe network has been completed at the downstream section of the component. Therefore, this sewage pipe network for the component connects at Liansheng Bridge with the existing sewage pipe network in the urban area so that the collected sewage can be delivered to Rongchang Urban Wastewater Treatment Plant for treatment.

Table 10-17 Comparison of Line Routes for Sewage Pipe Network of Sewage collection and treatment Works of Rongchang Component

Items	Alternatives	Scheme I (Alternative): Arrangement along the Embankment on the Right Bank of Laixi River	Scheme II (Recommended): Arrangement along the Embankment on the Left Bank of Laixi River	Merits and Demerits
Society	Relocation quantity due to the component (households)	0	0	Equivalent
	Floor area (10,000 m ²)	20000	18800	Scheme II is preferred.
Cost	Land acquisition cost (unit: RMB 10,000)	0	0	Equivalent

Alternatives		Scheme I (Alternative): Arrangement along the Embankment on the Right Bank of Laixi River	Scheme II (Recommended): Arrangement along the Embankment on the Left Bank of Laixi River	Merits and Demerits
Items	Cost of temporary occupation	663.5	635.6	Scheme II is preferred.
	Total investment (unit: RMB 10,000)	2118.58	2118.58	Equivalent
Environment	Environmental sensitive site	There are about 10 households in Dazu County and about 15 households in Rongchang that are involved.	There are about 24 households only in Rongchang that are involved.	Scheme II is preferred.
	Impact on water and soil loss	350t, the newly added investment in the conservation of soil and water is about RMB 550,000.	304t, the newly added investment in the conservation of soil and water is about RMB 500,000.	Scheme II is preferred.
	Physical cultural resources	Since it is relatively close to the right bank of Darong Bridge, the construction impact is relatively great.	Since it is relatively far away from Darong Bridge, the construction impact is relatively small.	Scheme II is preferred.
Technology	Technical difficulty and feasibility	On the right bank, there are only 2 residential agglomerations. If sewage pipes are arranged along the right bank, it will be more difficult to collect sewage via sewage pipe, which will reduce the sewage collection efficiency. At the same time, large quantity of river-crossing works correspondingly increase the work amount and construction difficulty.	Main residential agglomerations are located on the left bank of Laixi River. If pipe networks are arranged along the left bank, sewage collection efficiency will be high and the excavation and backfilling volumes are relatively small.	Scheme II is preferred.
	Construction condition	Relatively good	Relatively good	Equivalent
	Construction difficulty	The excavation and backfilling volumes in the pipe work are large and the construction difficulty is increased.	The excavation and backfilling volumes are relatively small.	Scheme II is preferred.
	Construction period	Relatively large work quantity and relatively long construction period	Relatively short construction period	Scheme II is preferred.

The left bank along Laixi River is the major residential agglomeration, and only two residential agglomerations are along the right bank. If the sewage conduits are arranged along the right bank of Laixi River, the difficulties in sewage collection for the sewage conduits will be increased, the efficiency of sewage collection will be reduced, and the pipe quantities and construction difficulties of the component will be increased at the same time, so Scheme II is adopted as the recommended scheme.

(2) Shizhu component

As the sewage pipe network for the component belongs to the supporting works for the embankment, the route selection of the network can only be arranged on the

embankment route selection. In order to address the existing scattered discharge of wastewater by residents at the upper part of north side of Longjing Road, an existing municipal service road (Longjing Road) is utilized for the component to lay a 2.6km pipe network with pipe diameter of 600mm to collect wastewater and deliver it to Shanxiashuiwu Sewage Pump Station. According to the site survey and the feasibility study scheme, there are residential houses under construction along both sides of Longjing Road. The sewage conduits to be constructed in the planning have an diameter of 400mm and a length only limited to a section at the community, and directly cross the river to connect the existing sewage pipe network of the bank, so they can not collect all the domestic sewage discharged by all residents at the upper part of north side of Longjing Road, unable to change the current situation of water discharge of neighboring residents. In addition, in the present pipe network planning, the pipe network planning has not been carried out for such area, so the scheme of arrangement of sewage pipe network along the river and Longjing Road is the only option, from view points of reduced land acquisition, practical solution to the existing scattered discharge of wastewater by all residents at the upper part of north side of Longjing Road.

10.4 Comparison of Dredging Schemes

Dredging of river channel is performed only for Shizhu component in the project. Comparisons are made between dredging schemes of cofferdam dredging and hydraulic sediment flushing, and the comparison results are shown in Table 10-18.

Table 10-18 Comparison of Dredging Schemes

Items	Cofferdam Dredging	Hydraulic Sediment Flushing
Approaches	During low-water period, diversion of river channel is performed via cofferdam so that construction could be carried out on the dry site. The solidified dredged sludge is excavated by the earthwork excavation machinery and loaded onto the dump truck, and the dump truck transports the dredged sludge to the designated places.	The sludge is mixed with water by means of mechanical agitation, and the dredged sludge is then delivered to the onshore sludge stockyard by means of dredge pump system.
Construction condition	Applicable to dredging of river channel whose surface width is small and during whose low-water period water flow is zero or small.	Applicable to dredging of river with perpetual water flow.
Occupation of land	Stocked along both river banks, with little occupation of land.	The special sludge stockyard is required, and the works covers a large area.
Environmental impact	The occupation of land for engineering construction is little, and the damage to terrestrial vegetation is minor.	The works covers a large area, plenty of terrestrial vegetation biomass is lost, and drained muddy water is increased considerably.

Through analysis of the dredging schemes, the hydraulic sediment flushing scheme enables dredging all the year round without being limited by time, but has large impacts on the environment in terms of occupation of land, forms of construction work, and damage to vegetation. Therefore, Scheme I, namely cofferdam dredging, is recommended as the dredging disposal scheme for the component in this assessment.

10.5 Comparison and Selection of Sludge Disposal Methods

In combination of the specific characteristics of river sludge produced during the dredging of the project, analyze different sludge disposal schemes.

(1) Scheme 1 (put into farmland)

It is applied to improve the soil conditions that the river sludge produced during dredging is put into the farmland as organic fertilizer, which has been researched by a number of countries and regions, with a wealth of experience gained. After application of river sludge, the soil would accumulate some heavy metal elements and the content of some metal elements in the crops would also be increased but still below the content specified in the hygiene standard for food or reference standard. Therefore, it can use the river sludge meeting standards as the fertilizer to cultivate crops and promote the growth of crops.

Each pollutant index of river sludge produced during dredging under the project can meet the requirements specified in *Control Standards for Pollutants in Sludges for Agricultural Use* (GB4284-84), and please see table 10-19.

Table 10-19 Comparison of Control Standard of Sludges for Agricultural Use

Monitoring Items	Monitoring Results	<i>Control Standards for Pollutants in Sludges for Agricultural Use (GB4284-84)</i>	
		For acid soil	For neutral and alkaline soil
Copper (mg/kg)	47.5	<250	<500
Zinc (mg/kg)	151	<500	<1000
Lead (mg/kg)	61.3	<300	<1000
Cadmium (mg/kg)	1.23	<5	<20
Chromium (mg/kg)	62.2	<600	<1000
Nickel (mg/kg)	40.1	<100	<200
Mercury (mg/kg)	0.15	<5	<15
Arsenic (mg/kg)	8.22	<75	<75

During public consultation, farmers are very worried about the impacts of application of sludge on the quality and yield of crops, so they do not support the river sludge for farmland.

(2) Scheme 2 (for greening along banks)

According to monitoring results of sludge, each index of the project dredging sludge can meet the requirements specified in *Disposal of Sludge from Municipal Wastewater Treatment Plant—Quality of Sludge Used in Gardens or Parks* (GB/T23486-2009). During implementation of the Project, ecological greening along banks of the Longhe River would be conducted for slope protection. Considering that a large amount of soil with organic fertilizer is required for the green building, therefore, dredging sludge can be applied to the nearest green space along banks.

Table 10-20 Control Standards of Sludge Used in Gardens or Parks

Monitoring Items	Monitoring Results	<i>Disposal of Sludge from Municipal Wastewater Treatment Plant—Quality of Sludge Used in Gardens or Parks</i> (GB/T23486-2009)	
		For acid soil	For neutral and alkaline soil
Copper (mg/kg)	47.5	<800	<1500
Zinc (mg/kg)	151	<2000	<4000
Lead (mg/kg)	61.3	<300	<1000
Cadmium (mg/kg)	1.23	<5	<20
Chromium (mg/kg)	62.2	<600	<1000
Nickel (mg/kg)	40.1	<100	<200
Mercury (mg/kg)	0.15	<5	<15
Arsenic (mg/kg)	8.22	<75	<75

However, such greening may affect the health of the population, which may produce pathogene, germs, smell and the like. Therefore, the residents are against the application of sludge to greening during the public consultation.

(3) Scheme 3 (as the covering soil of landfill)

Each pollutant index of the river sludge produced during the dredging of the Project can meet the requirements for covering soil of landfill specified in *Disposal of Sludge from Municipal Wastewater Treatment Plant - Quality of Sludge for Co-landfilling* (GB/T23485-2009), so that such sludge can be used as the covering soil of landfill. See table 10-21.

Table 10-21 Control Standards Comparison of Sludge with Covering Soil of Landfill Unit: mg/kg Dry Sludge

Monitoring Items	Monitoring Results	<i>Disposal of Sludge from Municipal Wastewater Treatment Plant - Quality of Sludge for Co-landfilling</i> (GB/T23485-2009)	
Copper	47.5		<1500
Zinc	151		<4000
Lead	61.3		<1000
Cadmium	1.23		<20

Chromium	62.2	<1000
Nickel	40.1	<200
Mercury	0.15	<25
Arsenic	8.22	<75

(4) Comparison and selection results of the schemes

Based on the monitoring results, the sludge meets the requirements stated in *Control Standard for Pollutants in Sludges for Agricultural Use (GB4284-84)*, *Treatment and Disposal of Sludge from Urban Wastewater Treatment Plant: Quality of Sludge for Garden and Greening Uses (GB/T23486-2009)* and in *Treatment and Disposal of Sludge from Urban Wastewater Treatment Plant: Quality of Sludge for Mixed Filling in Landfill (GB/T23485-2009)*. Through analyzing the monitoring results of the sludge, the dredging sludge of the Project can be applied to farmland, green land space, and can be used as the covering soil of landfill. However, it is understood through public consultation that the public are against the application of sludge to farm land and city greening area, but they can accept use of sludge for landfill covering because they think that scheme 3 is with lowest risk to environment and health, simplest and feasible technically.

In conclusion, it is recommended that scheme 3 is used as the sludge disposal scheme for the Project, i.e. taking the sludge as the covering soil of Yaodianzi landfill of Shizhu County.

11 Public Consultation and Information Disclosure

11.1 Purposes of Public Consultation and Information Disclosure

Public consultation and information disclosure form an important part of the Project's environmental impact assessment. The purposes of information disclosure are to make the Project's stakeholders timely know about the Project information, raise concerns about the impacts of the project, or make comments and suggestions on the Project. The purposes of public consultation are to obtain opinions of the public in the directly affected areas by the Project, and make the decision-making section timely find the potential problems, amend and improve the design scheme, and fundamentally solve the problems reflected by the public, which would make the process design, environmental protection measures and environmental monitoring and management of the Project more perfect and reasonable, and achieve the optimized unification of environmental, social and economic benefits for the Project.

The public consultation and information disclosure primarily targets the units and individuals within the environmentally affected areas by the Project, with special emphasis on the needs and appeals of school, hospital, non-governmental organization and the like.

11.2 Methods of Public Consultation

Two rounds of public consultation would be conducted, with one conducted in the Project preparation stage prior to the finalizing of the EIA outline, and another after completing the draft of the EIA report. The purposes of the first round of public consultation are to inform the relative stakeholders and the public of the relevant information and potential impacts of the Project, know about stakeholders and the public's awareness and understanding of the Project, the attitudes toward the Project and concerns about the environmental and social impacts, and primarily make contact with the stakeholders (including the affected population around the project and administrative authorities in respect of the river, road and the like involved in the Project) of the Project to listen to their comments and make timely feedback. The primary purpose of the second round of public consultation is to conduct consultation for the first draft of EIA report of the Project, report the public's comments and suggestions to the parties concerned, and make timely feedback which would be considered in the report.

According to *Temporary Methods of Public Consultation for EIA (HF [2006] No. 28)*, World Bank OP/BP4.01 *Environmental Assessment* and BP17.50 *Access to Information*, the public consultation of the project is mainly conducted in the form of forum and interview, and in combination of questionnaire and the like. See table 10-1 for the public consultation schedule, which comprehensively summarizes the public consultation in respect of social impact assessment and resettlement plan. See table 11-2-11-3 for the process of public consultation with the relevant departments and experts with regard to the physical cultural resources and three grounds for Dafu (Giant Buddha) Temple, Wanling Ancient Town and Xujiaba Site.

Table 11-1 Process of Public Consultation

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
Tongnan component	Before completion of EIA outline	<p>Forum 1 : Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, as well as local policies and regulations on the compensation for land acquisition and resettlement of the Tongnan County from the participants.</p> <p>Forum 2 :Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, as well as local policies and regulations on the compensation for land acquisition and resettlement of the Tongnan County from the participants.</p> <p>Public consultation meetings and interviews: EIA organization introduces the component background, component content, the possible impacts produced by the component, the environmental mitigation measures and the like to the participants. Listen to the participants' comments, requests and suggestions, and exchange views on issues concerned by the public.</p> <p>Group visit: Social impact assessment team should know about the impacts of the component construction on the relevant interest groups, identify key social problems, and know about relevant interest groups' comments and suggestions.</p> <p>Household survey: Social impact assessment team respectively selects 30 rural households in form of non-probability sampling from the villages along the route of the component to know about the social and economic development and flood control situations of the component affected areas, and the impacts of the</p>	Chongqing Institute of Geology and Mineral Resources and Tongnan Longquan Water Resources Development Co., Ltd.	<p>Forum 1 : Leaders of Zitong Subdistrict Office, leaders and villager representatives of Shengli Village, Qianjin Village, Xinsheng Village and Shinian Village.</p> <p>Forum 2 : Department heads from Government, Land and Resources Bureau, Environmental Protection Bureau, Bureau of Culture, Broadcasting, Television, Press and Publication, Water Authority, Immigration Office, Agricultural Committee, Women's Federation etc. of Tongnan County.</p> <p>Public consultation meetings and interviews : Department heads from Government, Land and Resources Bureau, Bureau of Culture, Broadcasting, Television, Press and Publication, Immigration Office, Agricultural Committee, Women's Federation etc. of Tongnan County and villager representatives of affected villages such as Shengli Village, Qianjin Village, Xinsheng Village, Shinian</p>	Starting on May 9, 2013.	<p>Forum 1 : Zitong Subdistrict Office.</p> <p>Forum 2 : Tongnan Longquan Water Resources Development Co., Ltd.</p> <p>Public consultation meetings and interviews : Zitong Subdistrict Office and village committees of Qianjin Village and Xinsheng Village.</p> <p>Household survey : Shengli Village, Qianjin Village, Xinsheng Village, and Shinian Village etc.</p> <p>Interview 1 : Zitong Subdistrict Office and villages along the route of the component.</p> <p>Interview 2 : Villages</p>	OP4.01 : At least two rounds of public consultations, with the first round conducted after screening environmental issues but before finalizing the TOR.

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		<p>component construction on different households and population with different identities within the areas, master their attitudes, and consult affected population's attitudes and suggestions on the proposed component.</p> <p>Interview 1 : Investigation group interviews partial affected villagers to know about their quantity of land occupied, the degree of being affected, intended use of compensation for land acquisition, revenue recovery plan, hopes, requirements, suggestions and the like.</p> <p>Interview 2 : Social impact assessment team knows about the proposed component situations via the interviewee, obtains the basically economic and social situations and woman status of the involved villages, identifies the relevant interest groups of the component, and knows about the positive and negative impacts of the component on the constructed areas.</p> <p>Questionnaire 1 : Conduct questionnaire survey for some affected villagers to know about the basic situations, employment situations, income situations, family property situations etc. of the family members, and villager's attitudes, comments, suggestions and the like on the component.</p> <p>Questionnaire 2 : EIA organization conducts questionnaire survey for affected villagers around the component to know about their awareness and understanding of the component, their attitudes toward the component and concerns about relevant environmental and social impacts.</p>		<p>Village etc.</p> <p>Household survey: 30 rural households along the route of the component.</p> <p>Interview 1 : Officers of Zitong Subdistrict Office, and leaders, women's director, village representatives and resettlers of Shengli Village, Qianjin Village, Xinsheng Village and Shinian Village.</p> <p>Interview 2 : Department heads from Government, Land and Resources Bureau, Environmental Protection Bureau, Bureau of Culture, Broadcasting, Television, Press and Publication, Water Authority, Immigration Office, Agricultural Committee, Women's Federation etc. of Tongnan County.</p> <p>Questionnaire 1 : Villager representatives of Shengli Village, Qianjin Village, Xinsheng Village ,Shinian Village etc.</p> <p>Questionnaire 2 : Residents along the route of the component.</p>		<p>along the route of the component.</p> <p>Questionnaire 1 : Villages along the route of the component.</p> <p>Questionnaire 2 : Villages along the route of the component.</p>	

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
	After completion of first draft of environmental impact report	<p>① Public consultation meetings and interviews: EIA organization consults relevant publics about the environmental impact report of the component, reports the public's comments and suggestions to the parties concerned, and makes timely feedback which would be considered in the report.</p> <p>② Questionnaire and publicity : EIA organization conducts questionnaire survey for the affected residents around the component, publicizes information in local websites, newspapers and other media to the public, consults the relevant publics about the environmental impact report of the component, and reports the public's comments and suggestions to the parties concerned, and makes timely feedback which would be considered in the report.</p>	Chongqing Institute of Geology and Mineral Resources	<p>Public consultation meetings and interviews: Villager representatives of affected Shengli Village, Xinsheng Village, Qianjin Village and Shinian Village, and Zitong public service personnel at the community level.</p> <p>Questionnaire and publicity : Conduct questionnaire survey for the villager representatives along the route of the component, and the public information would be released in Tongnan Daily and local websites.</p>	Starting on August 29, 2013.	<p>Public consultation meetings and interviews: meeting room of Zitong Subdistrict Office.</p> <p>Questionnaire and publicity: village committees and places where crowds are gathered along the route of the component, Tongnan County Water Authority website, and Tongnan Daily.</p>	OP4.01 : The second round of public consultation is conducted before finalizing the draft of the report, and borrower should publicize the full EA report to the public (report would be placed in Zitong Subdistrict Office and village committees of Shengli Village, Xinsheng Village and Shinian Village.)
Rongchang component	Before completion of EIA outline	<p>① Forum 1 : Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, local policies and regulations on the compensation for land acquisition and resettlement, as well as the wastewater discharge and management conditions of Rongchang County from the participants.</p> <p>② Forum 2 : Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, local policies and regulations on the compensation for land acquisition and resettlement, as well as the wastewater discharge and management conditions of Rongchang County from the participants.</p> <p>③ Forum 3 : Investigation group knows about the</p>	CCTEG Chongqing Engineering Co., Ltd. and Hongyu Water Resources Development Co., Ltd. of Rongchang County	<p>Forum 1 : Neighborhood committees and villager representatives of Baochengsi Community and Dujiba Community.</p> <p>Forum 2 : Mayor and deputy mayor of Wanling Town, director of Changzhou Subdistrict Office, director of women's Federation etc.</p> <p>Forum 3 : Deputy director general of Rongchang Administration of Culture, Radio, Television, Press and Publication, and cultural relics</p>	Starting on August 12, 2013.	<p>Forum 1 : Baochengsi Community.</p> <p>Forum 2 : Changzhou Subdistrict Office.</p> <p>Forum 3 : Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County.</p> <p>Public consultation meetings and interviews: Wanling Town and Changzhou</p>	OP4.01 : At least two rounds of public consultations, with the first round conducted after screening environmental issues but before finalizing the TOR.

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		<p>overview of economic and social development, the development planning, the flood control planning, local policies and regulations on the compensation for land acquisition and resettlement, as well as the wastewater discharge and management conditions of Rongchang County, and the possible impacts of component construction on the Darong Bridge and measures to be taken from the participants.</p> <p>④ Public consultation meetings and interviews : EIA organization introduces the component background, component content, the possible impacts produced by the component, the environmental mitigation measures and the like to the participants. Listen to the participants' comments, requests and suggestions, and exchange views on issues concerned by the public.</p> <p>⑤ Group visit : Social impact assessment team should know about the impacts of the component construction on the relevant interest groups, identify key social problems, and know about relevant interest groups' comments and suggestions.</p> <p>⑥ Household survey: Social impact assessment team respectively selects 15 urban households and 30 rural households in form of non-probability sampling from Wanling Town and the villages along the route of the component to know about the social and economic development, flood control and wastewater treatment situations of the component affected areas, the impacts of the component construction on different households and population with different identities within the areas, master their attitudes, and consult affected population's attitudes and suggestions on the proposed component.</p> <p>⑦ Interview 1 : Investigation group interviews partial</p>		<p>experts.</p> <p>Public consultation meetings and interviews : Resident representatives of Baochengsi Community, Dujiaba Community, Family Surnamed Zhao's Yard, Wanling Town, Changzhou Subdistrict Office etc.</p> <p>Group visit : 2 representative groups of urban residents, 3 representative groups of rural residents, and 2 representative groups of women.</p> <p>Household survey : 15 urban households and 30 rural households.</p> <p>Interview 1 : Village representatives of Wanling Town and Changzhou Subdistrict affected by the land acquisition.</p> <p>Interview 2 : The functional department heads from Government Office, Bureau of Culture, Broadcasting, Television, Press and Publication, Transportation Committee, Women's</p>		<p>Subdistrict Office.</p> <p>Group visit : Wanling Town, Changzhou Subdistrict Office.</p> <p>Household survey : Baochengsi Community, Dujiaba Community, Family Surnamed Zhao's Yard, Wanling Town, Changzhou Subdistrict Office.</p> <p>Interview 1 : Wanling Town.</p> <p>Interview 2 : Government Office, Civil Affairs Bureau, Transportation Committee, Bureau of Culture, Broadcasting, Television, Press and Publication, Human Resources and Social Safeguard Bureau, Land and Resources Bureau, Development and Reform Commission, Environmental Protection Bureau, Women's Federation of Rongchang County, Wanling Town and</p>	

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		<p>affected villagers to know about their quantity of land occupied, the degree of being affected, intended use of compensation for land acquisition, revenue recovery plan, hopes, requirements, suggestions and the like.</p> <p>⑧ Interview 2 : Social impact assessment team knows about the proposed component situations via the interviewee, obtains the basically economic and social situations, poverty situations, and woman status of the involved villages, identifies the relevant interest groups of the component, and knows about the positive and negative impacts of the component on the constructed areas.</p> <p>⑨ Questionnaire 1 : Conduct questionnaire survey for some affected villagers to know about the basic situations, employment situations, income situations, family property situations etc. of the family members, and villager's attitudes, comments, suggestions and the like on the component.</p> <p>⑩ Questionnaire 2 : EIA organization conducts questionnaire survey for the affected villagers around the component to know about their awareness and understanding of the component, their attitudes toward the component and concerns about relevant environmental and social impacts.</p>		<p>Federation, Agricultural Committee etc. of Rongchang County, the major leaders from Wanling Town and Changzhou Subdistrict Office, the party branch of Baochengsi Community and Dujiaba Community, the major leaders from village committee (including women's director) etc.</p> <p>Questionnaire 1 : Villager representatives from Baochengsi and Dujiaba.</p> <p>Questionnaire 2 : 32 residents along the route of the component.</p>		<p>Changzhou Subdistrict.</p> <p>Questionnaire 1 : Baochengsi and Dujiaba Village.</p> <p>Questionnaire 2 : Residents along the route of the component.</p>	
	<p>After completion of first draft of environmental impact report</p>	<p>① Public consultation meetings and interviews: EIA organization consults relevant publics about the environmental impact report of the component, reports the public's comments and suggestions to the parties concerned, and makes timely feedback which would be considered in the report.</p> <p>② Questionnaire : EIA organization conducts</p>	<p>CCTEG Chongqing Engineering Co., Ltd.</p>	<p>Public consultation meetings and interviews: Villager representatives of Baochengsi Community, Dujiaba Community, Wanling Town and Changzhou Subdistrict along the route of the component.</p>	<p>Starting on October 18, 2013</p>	<p>Public consultation meetings and interviews: Changzhou Subdistrict.</p> <p>Questionnaire : Villages along and around the route of the</p>	<p>OP4.01 : The second round of public consultation is conducted before finalizing the draft of the report, and borrower should publicize the full EA report to the</p>

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		questionnaire survey for the residents around the component to consult relevant publics about the environmental impact report of the component, report the public's comments and suggestions to the parties concerned, and make timely feedback which would be considered in the report.		Questionnaire : Villager representatives of the villages along the route of the component.		component.	public (report would be placed in the village committees of the villages along the route of the component.).
Pengshui component	Before completion of EIA outline	<p>① Forum 1 : Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, local policies and regulations on the compensation for land acquisition and resettlement, as well as the wastewater discharge and management conditions of Pengshui County from the participants.</p> <p>② Forum 2 : Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, local policies and regulations on the compensation for land acquisition and resettlement, as well as the wastewater discharge and management conditions of Pengshui County, and the environmental issues possibly produced due to the construction of the component.</p> <p>Public consultation meetings and interviews: EIA organization introduces the component background, component content, the possible impacts produced by the component, the environmental mitigation measures and the like to the participants. Listen to the participants' comments, requests and suggestions, and exchange views on issues concerned by the public.</p> <p>④ Group visit : Social impact assessment team should know about the impacts of the component construction on the relevant interest groups, identify key social problems, and know about relevant interest groups' comments and</p>	Changjiang Water Resource Protection Institute and Hongyu Water Service Investment and Construction Co., Ltd. of Pengshui County, Chongqing Municipality	<p>Forum 1 : Government, Land and Resources Bureau, Planning Bureau, Transportation Committee, Water Authority, Immigration Office, Environmental Protection Bureau, Tourism Administration, Urban Utilities Bureau, Centers for Disease Control, Cultural Heritages Management Office, Development and Reform Commission, Transportation Committee, Construction Committee, Agricultural Committee of Pengshui County, Linjiang neighborhood Committee, Dianshui New Town Management Committee, Shaoqing Subdistrict, Zhongye Group, Shangtang water plant etc. and villager representatives.</p> <p>Forum 2 : Representatives from Linjiang Community, Zhangjiaba Community, Binjiang Community, Xiatang Neighborhood Committee, Xiatang Primary School, Pengshui Agricultural</p>	Starting on August 26, 2013.	<p>Forum 1 : Pengshui County Government.</p> <p>Forum 2 : Water Authority of Pengshui County.</p> <p>Interview and Questionnaire : Linjiang Community, Zhangjiaba Community etc.</p> <p>Interview 1 : Shaoqing Subdistrict.</p> <p>Interview 2 : The Government, Land and Resources Bureau, Water Authority, Transportation Committee, Immigration Office, Environmental Protection Bureau, Women's Federation, Administration for Religious Affairs etc. of Pengshui County, and</p>	OP4.01 : At least two rounds of public consultations, with the first round conducted after screening environmental issues but before finalizing the TOR.

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		<p>suggestions.</p> <p>⑤ Household survey: Social impact assessment team respectively selects 30 urban households and 30 rural households in form of non-probability sampling from the villages along the route of the component to know about the social and economic development and flood control situations of the component affected areas , the impacts of the component construction on different households and population with different identities within the areas, master their attitudes, and consult affected population's attitudes and suggestions on the proposed component.</p> <p>⑥ Interview 1 : Investigation group interviews partial affected villagers to know about their quantity of land occupied, the degree of being affected, intended use of compensation for land acquisition, revenue recovery plan, hopes, requirements, suggestions and the like.</p> <p>⑦ Interview 2 : Social impact assessment team knows about the proposed component situations via the interviewee, gains the basic situations of the component involved areas, identifies the relevant interest groups of the component, and knows about the positive and negative impacts of the component on the constructed areas.</p> <p>⑧ Questionnaire 1 : Conduct questionnaire survey for some affected villagers to know about the basic situations, employment situations, income situations, family property situations etc. of the family members, and villager's attitudes, comments, suggestions and the like on the component.</p> <p>⑨ Questionnaire 2 : EIA organization conducts questionnaire survey for affected villagers around the</p>		<p>Committee, Pengshui Administration of Culture, Radio, Television, Press and Publication in charge of Xujiaba Site, Pengshui Forestry Bureau etc.</p> <p>Public consultation meetings and interviews: Dianshui New Town Management Committee, Shaoqing Subdistrict and other related units, individuals and unit representatives.</p> <p>Interview and Questionnaire : Representatives from Linjiang Community, Zhangjiaba Community etc., and Xiatang Primary School etc.</p> <p>Interview 1 : Representatives of affected residents.</p> <p>Interview 2 : Functional department heads from Government, Water Authority, Immigration Office, Environmental Protection Bureau, Health Bureau, Women's Federation etc., township leaders, major leaders (including women's director) from party branch and village committee in the investigation site, and owners</p>		<p>Shaoqing Subdistrict.</p> <p>Group visit: Communities, subdistricts and villages along the route of the component.</p> <p>Household survey : Linjiang Community and Zhangjiaba Community.</p> <p>Public consultation meetings and interviews: Dianshui New Town Management Committee, Shaoqing Subdistrict and other related units, individuals and unit representatives.</p> <p>Questionnaire : Villages along the route of the component.</p>	

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		component to know about their awareness and understanding of the component, their attitudes toward the component and concerns about relevant environmental and social impacts.		of small shops. Group visit : Residents, merchants etc. around the component. Household survey : Households of Linjiang Community, Zhangjiaba Community and Binjiang Community.			
	After completion of first draft of environmental impact report	<p>① Public consultation meetings and interviews: EIA organization consults relevant publics about the environmental impact report of the component, reports the public's comments and suggestions to the parties concerned, and makes timely feedback which would be considered in the report.</p> <p>② Questionnaire : EIA organization conducts questionnaire survey for the residents around the component to consult relevant publics about the environmental impact report of the component, report the public's comments and suggestions to the parties concerned, and make timely feedback which would be considered in the report.</p>	Changjiang Water Resource Protection Institute	<p>Public consultation meetings and interviews: Dianshui New Town Management Committee, Shaoqing Subdistrict and other related units, individuals and unit representatives.</p> <p>Questionnaire : 89 residents along the route of the component.</p>	Starting on November 13, 2013.	<p>Public consultation meetings and interviews: Dianshui New Town Management Committee, Shaoqing Subdistrict and other related units, individuals and unit representatives.</p> <p>Questionnaire : Villages along the route of the component.</p>	OP4.01: The second round of public consultation is conducted before finalizing the draft of the report, and borrower should publicize the full EA report to the public (report would be placed in Dianshui New Town Management Committee.
Shizhu component	Before completion of EIA outline	① Forum 1 : Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, local policies and regulations on the compensation for land acquisition and resettlement, as well as the wastewater discharge and management conditions of Shizhu County from the participants.	Zongxing Technology	<p>Forum 1 : Leaders of Shuangqing Community, leader representatives and villager representatives of Hongjing Community and Hongxing Community.</p> <p>Forum 2 : Representatives</p>	Starting on August 22, 2013.	<p>Forum 1 : Shizhu Urban Construction Bureau.</p> <p>Forum 2 : The Government of Shizhu County.</p>	OP4.01 : At least two rounds of public consultations, with the first round conducted after screening environmental issues but before

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		<p>② Forum 2 : Investigation group knows about the overview of economic and social development, the development planning, the flood control planning, local policies and regulations on the compensation for land acquisition and resettlement, as well as the wastewater discharge and management conditions of Pengshui County, and the environmental issues possibly produced due to the construction of the component.</p> <p>Public consultation meetings and interviews: EIA organization introduces the component background, component content, the possible impacts produced by the component, the environmental mitigation measures and the like to the participants. Listen to the participants' comments, requests and suggestions, and exchange views on issues concerned by the public.</p> <p>④ Interview and Investigation : Investigation group interviews Shuangqing Community, Hongjing Community, Hongxing community etc. along the route of the component to know about the impacts of the component construction on the relevant interest groups, identify key social problems, and know about relevant interest groups' comments and suggestions.</p> <p>⑤ Interview 1 : Social impact assessment team knows about the proposed component situations via the interviewee, obtains the basically economic and social situations, poverty situations, and woman status of the involved villages, identifies the relevant interest groups of the component, and knows about the positive and negative impacts of the component on the constructed areas.</p> <p>⑥ Interest group interview : Social impact assessment team interviews partial affected villagers to know about their quantity of land occupied, the degree of being</p>		<p>from Government, Environmental Protection Bureau, Bureau of Culture, Broadcasting, Television, Press and Publication, Land and Resources Bureau, Water Authority, Agriculture Committee, Urban Construction Bureau, Immigration Office, Women's Federation etc. of Shizhu County.</p> <p>Public consultation meetings and interviews : Functional department heads from Government, Environmental Protection Bureau, Bureau of Culture, Broadcasting, Television, Press and Publication, Land and Resources Bureau, Water Authority, Agricultural Committee etc. of Shizhu County, and the heads from Women's Federation, Urban Construction Bureau etc.</p> <p>Interview and investigation : Resident representatives of Shuangqing Community, Hongjing Community and Hongxing Community.</p> <p>Interview 1 : Functional department heads from Government, Environmental</p>		<p>Interview : Shuangqing Community, Hongjing Community and Hongxing Community.</p> <p>Interview 1 : Government, Environmental Protection Bureau, Bureau of Culture, Broadcasting, Television, Press and Publication, Land and Resources Bureau, Water Authority, Agriculture Committee, Women's Federation and Urban Construction Bureau, Hongjing Community and Chengnan Village of Shizhu County.</p> <p>Interest group interview : Shuangqing Community, Hongjing Community and Hongxing Community.</p> <p>Interview 2 : Agriculture Committee and Bureau of Culture, Broadcasting, Television, Press and Publication of Shizhu</p>	<p>finalizing the TOR.</p>

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		<p>affected, intended use of compensation for land acquisition, revenue recovery plan, hopes, requirements and suggestions.</p> <p>⑦ Interview 2 : EIA organization introduces the component construction methods, impacts during construction and other information in respect of the component to the relevant leaders and experts of cultural relics administration and natural habitat management sector, and fully exchanges views on how to reduce environmental impact with relevant sectors.</p> <p>⑩ Questionnaire : EIA organization conducts questionnaire survey for the affected villagers along the route of the component to know about their awareness and understanding of the component, their attitudes toward the component and concerns about relevant environmental and social impacts.</p>		<p>Protection Bureau, Land and Resources Bureau, Water Authority, Agriculture Committee etc. of Shizhu County, Women's Federation, Urban Construction Bureau, Hongjing Community and Chengnan Village (including Women's Director).</p> <p>Interest group interview : Resident representatives of Shuangqing Community, Hongjing Community and Hongxing Community.</p> <p>Interview 2 : Leaders and experts respectively from Shizhu Agriculture Committee and Bureau of Culture, Broadcasting, Television, Press and Publication.</p> <p>Questionnaire : 56 residents along the route of the component.</p>		<p>County.</p> <p>Questionnaire : Villages and residential areas along the route of the component.</p>	
	<p>After completion of first draft of environmental impact report</p>	<p>① Public consultation meetings and interviews: EIA organization consults relevant publics about the environmental impact report of the component, reports the public's comments and suggestions to the parties concerned, and makes timely feedback which would be considered in the report.</p> <p>② Questionnaire : EIA organization conducts questionnaire survey for the affected villagers along the</p>	<p>Zongxing Technology</p>	<p>Public consultation meetings and interviews : 56 representatives from Shuangqing Community, Hongjing Community, Hongxing Community ,Chengnan Village etc.</p>	<p>Starting on November 15, 2013.</p>	<p>Public consultation meetings and interviews : Neighborhood committee of Shuangqing Community.</p> <p>Questionnaire :</p>	<p>OP4.01 : The second round of public consultation is conducted before finalizing the draft of the report, and borrower should publicize the full EA report to the</p>

Items	Component Progress Stage	Contents	Investigators	Respondents	Date	Place	World bank requirements
		route of the component to consult relevant publics about the environmental impact report of the component, report the public's comments and suggestions to the parties concerned, and make timely feedback which would be considered in the report.		Questionnaire : Villager representatives of the villages along the route of the component.		Villages along the route of the component.	public (report would be placed in the village committees of the villages along the route of the component.).

Table 10-2 Physical cultural resources consultation schedule

EIA Progress Stage	Items	Physical Cultural Resources	Contents	Investigators	Respondents	Date	Place	World Bank Requirements
Before completion of EIA outline	Tongnan component	National protected cultural relic-Giant Buddha Temple	Interview : EIA organization introduces the component background, possible impacts of the component content (selection, land occupation, construction etc.), environmental mitigation measures, the potential impacts of the component on Giant Buddha Temple and other information to the relevant administrative authorities of Giant Buddha Temple, listens to relevant authorities' comments, and exchanges views on issues concerned by the authorities.	Chongqing Institute of Geology and Mineral Resources	Interview : Heads from Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Tongnan County.	Starting on May 9, 2013.	Interview : Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Tongnan County.	OP4.11: Consult related authorities and experts, confirm the importance of physical cultural resources, identify possible problems, conduct analysis of potential impacts, and explore measures to prevent and mitigate impacts.
	Rongchang	Chongqing	Interview: EIA organization	CCTEG	Interview : Heads from	Starting	Interview :	

EIA Progress Stage	Items	Physical Cultural Resources	Contents	Investigators	Respondents	Date	Place	World Bank Requirements
	component	Municipal protected cultural relic - Darong Bridge and Rongchang County protected cultural relic - Wanling Ancient Town	introduces the component background, possible impacts of the component content (selection, land occupation, construction etc.), environmental mitigation measures, the potential impacts of the component on Darong Bridge and Wanling Ancient Town and other information to the relevant administrative authorities of Darong Bridge and Wanling Ancient Town, listens to relevant authorities' comments, and exchanges views on issues concerned by the authorities.	Chongqing Engineering Co., Ltd.	Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County.	on August 12, 2013.	Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County.	
	Pengshui component	Chongqing municipal protected cultural relic – Xujiaba Site	Interview : EIA organization introduces the component background, possible impacts of the component content (selection, land occupation, construction etc.), environmental mitigation measures, the potential impacts of the component on Xujiaba Site and other information to the relevant administrative authorities of Xujiaba Site, listens to relevant authorities' comments, and exchanges views on issues concerned by the authorities.	Changjiang Water Resource Protection Institute	Interview : Heads from Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Pengshui County.	Starting on August 22, 2013.	Interview : Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Pengshui County.	

EIA Progress Stage	Items	Physical Cultural Resources	Contents	Investigators	Respondents	Date	Place	World Bank Requirements
After completion of first draft of environmental impact report	Tongnan component	National protected cultural relic-Giant Buddha Temple	Interview: EIA organization provides the environmental impact report draft of the component for relevant authorities of Giant Buddha Temple, listens to relevant authorities' comments, and exchanges views on issues concerned by the authorities.	Chongqing Institute of Geology and Mineral Resources	Interview : Heads from Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Tongnan County, and relevant experts.	Starting on August 29, 2013.	Interview : Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Tongnan County.	
	Rongchang component	Chongqing municipal protected cultural relic - Darong Bridge and Rongchang county-level protected cultural relic - Wanling Ancient Town	Interview: EIA organization provides the environmental impact report draft of the component for relevant authorities of Darong Bridge and Wanling Ancient Town, listens to relevant authorities' comments, and exchanges views on issues concerned by the authorities.	CCTEG Chongqing Engineering Co., Ltd.	Interview : Heads from Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County.	Starting on October 18, 2013	Interview : Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County.	
	Pengshui component	Chongqing municipal protected cultural relic –	Interview: EIA organization provides the environmental impact report draft of the component for relevant authorities of Xujiaba Site, listens	Changjiang Water Resource Protection Institute	Interview : Heads from Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture, Broadcasting, Television, Press and Publication of	Starting on November 15, 2013.	Interview : Chongqing Municipal Administration of Cultural Heritage and Bureau of Culture,	

EIA Progress Stage	Items	Physical Cultural Resources	Contents	Investigators	Respondents	Date	Place	World Bank Requirements
		Xujiaba Site	to relevant authorities' comments, and exchanges views on issues concerned by the authorities.		Pengshui County.		Broadcasting, Television, Press and Publication of Pengshui County.	

Table 10-3 Process of Public Consultation on Natural Habitats

EIA Progress Stage	Items	Natural Habitats	Contents	Investigators	Respondents	Date	Place	World Bank Requirements
Before completion of EIA outline	Tongnan component	Xibutang spawning ground and the Huangjiaotang spawning ground	Interview : EIA organization introduces the component background, possible impacts of the component content (land occupation, construction etc.), environmental mitigation measures, the potential impacts of the component on spawning ground and other information to the administrative authorities of three grounds, listens to authorities' comments, and exchanges views on issues concerned by the authorities.	Chongqing Institute of Geology and Mineral Resources	Interview : Heads from Water Authority of Tongnan County, and the leaders and experts from Agriculture Committee of Tongnan County.	Starting on May 9, 2013.	Interview : Water Authority and Agriculture Committee of Tongnan County.	OP4.04: Consult related authorities and experts, confirm the importance of spawning ground, identify possible problems, conduct analysis of potential impacts, and explore measures to prevent and mitigate impacts.

<p>After completion of first draft of environmental impact report</p>	<p>Tongnan component</p>	<p>Xibutang spawning ground and the Huangjiaotang spawning ground</p>	<p>Interview: EIA organization provides the environmental impact report draft of the component for relevant authorities of three grounds, listens to relevant authorities' comments, and exchanges views on issues concerned by the authorities.</p>	<p>Chongqing Institute of Geology and Mineral Resources</p>	<p>Interview : Heads from Water Authority of Tongnan County, and the heads and experts from Agriculture Committee of Tongnan County.</p>	<p>2013.8.29</p>	<p>Interview : Water Authority and Agriculture Committee of Tongnan County.</p>	
---	--------------------------	---	---	---	---	------------------	--	--

11.3 Summary of Public Consultation, Opinions and Feedback

Refer to Table 11-4 for the comprehensive summary of public consultation; refer to Table 11-5 for the summary of consultation with relevant departments and experts about physical cultural resources; refer to Table 11-6 for the summary of consultation with relevant departments and experts about natural habitat. See Attachment 1 for pictures relating to public consultation.

Table 11-4 Summary Sheet of Public Consultation

Items	Stage	Questions or Opinions of the Public	Explanatory Replies to Public Opinions and the Effects
Tongnan Component	Before completion of EIA outline	<p>① The adoption of cash compensation is preferred.</p> <p>② It is hoped that the compensation policy standard for the Project can be implemented according to the spirit of documents issued by the state and municipality.</p>	<p>The investigation team feeds the public opinions back to the project implementer. The unit expresses that the compensation standard for land acquisition would be implemented in strict accordance with the documents issued by the state and Chongqing Municipality and that the means of cash compensation would be adopted.</p> <p>The investigated public are satisfied.</p>
		<p>18.5% of people wish to see the project construction, with no objection, and 98.5% of people consider the Project beneficial to the overall local development.</p> <p>35% of farmers are unaware of the policies related to land acquisition for the Project, and 40% of migrants do not know how to complain if treated unfairly during land acquisition.</p>	<p>The personnel of project office and investigation team have publicized relevant laws, regulations and policies extensively.</p> <p>All the interviewees have learned that they could make an appeal through legal complaints mechanism when their lawful rights and interests are infringed upon.</p>
		<p>① They wish the Project would be completed as soon as possible.</p> <p>② Land acquisition, relocation and resettlement should be carried out properly to ensure that the living standards of affected population shall not be reduced.</p> <p>③ Construction dust and noise should be controlled and shall not have large impacts on the population along the route of the Project.</p> <p>④ The farmers losing land and the villagers whose land is requisited as well as their children should be helped with</p>	<p>EIA organization feeds relevant opinions back to the project implementer and government agencies. The project implementer promises to prepare the reasonable compensation standard, give priority to employment of local labor under permissible conditions, and adequately communicate with the villagers in the process of land acquisition, achieving the villagers' satisfaction with compensation. It is also stated that for the environmental protection issue, a series of protective measures would be taken in the EIA to ensure that the environmental impacts would be within the acceptable range.</p> <p>The investigated public are satisfied.</p>

	<p>employment.</p> <p>⑤ Importance should be attached to environmental protection to prevent the water sources and farmland in the villages from pollution.</p> <p>⑥ The compensation standard should be raised as much as possible; the compensation cost should be reasonable and distributed to the recipients in time; the compensation information should be public and transparent.</p> <p>⑦ The local residents should be employed as many as possible to address the employment issue.</p>	
	<p>98.5% of people wish to see the project construction, with no objection.</p>	<p>According to the EIA organization, emission standards would be available for each pollutant emission of the Project, and the impacts of the Project on the environment would be minimized.</p> <p>The public are satisfied.</p>
	<p>As part of the proposed project would be located in the class B and C protection zones of Dingming Mountain Scenic Spot, and would also occupy Fujiang River National Wetland Park, the EIA organization organizes the discussion between competent department, experts, and leaders according to requirement.</p>	<p>The Owner expresses that the implementation would be in strict accordance with the requirements by all management departments.</p> <p>The relevant department has given an official written reply on the Project.</p>
<p>After completion of first draft of environmental impact report</p>	<p>Attention should be paid to safety during construction, with due regard to dealing with the local surplus labor.</p> <p>The damage to trees should be reduced during construction period, with certain compensation for temporary occupation of land at the same time.</p>	<p>The construction organization expresses that they would employ local people as many as possible and ensure the safety of working staff and surrounding residents, compensate reasonably according to relevant provisions of China, and also carry out leveling and revegetation after construction completion.</p> <p>The public are satisfied.</p>
	<p>100% of people think the environmental impact analysis for the Project is reasonable; 100% of people agree or basically agree on the environmental pollution mitigation measures taken for the Project; 100% of people express support</p>	<p>The EIA organization expresses to strictly abide by the measures in the environmental management plan for the Project to ensure that the environmental impacts of the Project would be mitigated to an acceptable degree.</p>

		for the project construction.	The public are satisfied.
Rongchang component	Before completion of EIA outline	<p>① The adoption of cash compensation for temporary occupation of land is preferred.</p> <p>② It is hoped that the compensation policy standard for the Project can be implemented according to the spirit of documents issued by the state and Chongqing municipality.</p> <p>③ The project construction would improve the local environmental quality.</p> <p>④ The project construction would benefit the villages along the pipe network.</p>	<p>The investigation team feeds the public opinions back to the Project implementer. The unit expresses that the compensation standard for land acquisition would be implemented in strict accordance with the documents issued by the state and Chongqing Municipality and that the means of cash compensation and resettlement would be adopted.</p> <p>The investigated public are satisfied.</p>
		<p>44.2% of farmers are unaware of the policies related to land acquisition for the Project, and 50.5% of people do not know how to complain if treated unfairly during land acquisition.</p>	<p>The personnel of project office and investigation team have publicized relevant laws, regulations and policies extensively.</p> <p>All the interviewees have learned that they could make an appeal through legal complaints mechanism when their lawful rights and interests are infringed upon.</p>
		<p>① They wish the Project would be completed as soon as possible.</p> <p>② Land acquisition, relocation and resettlement should be carried out properly to ensure that the living standards of affected population shall not be reduced.</p> <p>③ The safety of passing vehicles nearby and pedestrians should be ensured during construction.</p> <p>④ The farmers losing land and the villagers whose land is requisited as well as their children should be helped with employment.</p> <p>⑤ Importance should be attached to environmental protection to prevent the water sources and farmland in the villages from pollution.</p> <p>⑥ The compensation standard should be raised as much as possible; the compensation cost should be reasonable</p>	<p>The social impact assessment unit feeds relevant opinions back to the project implementer and government agencies. The project implementer promises to prepare the reasonable compensation standard, give priority to employment of local labor under permissible conditions, conduct civilized construction according to relevant regulations, protect the local land and environment, and adequately communicate with the villagers in the process of land acquisition, achieving the villagers' satisfaction with compensation. It is also stated that for the environmental protection issue, a series of protective measures would be taken in the EIA to ensure that the environmental impacts would be within the acceptable range.</p> <p>The investigated public are satisfied.</p>

Pengshui component		<p>and distributed to the recipients in time; the compensation information should be public and transparent.</p> <p>⑦ It is recommended that the Owner should often communicate with the villagers to avoid conflicts.</p>	
		<p>① Some villagers of Dujiba Community are concerned about the excessive noise and dust during construction period.</p> <p>② As roads would be crossed in the pipe network works, traffic management department is concerned about road safety.</p>	<p>The construction organization promises that the vehicles delivering stonework & earthwork and construction material would be cleaned before setting out and covered during the delivery, with the limited speed and timely communication, ensuring that the normal life of residents along the route would not be affected. The public are satisfied.</p> <p>The construction organization promises to apply the mature pipeline crossing process to ensure safety in crossing roads. Traffic management department is satisfied.</p>
		<p>100% of people express support for the project construction; 75% of people express that the adverse impacts during construction period are minor and acceptable whereas the rest of them express that there are no impacts.</p>	<p>According to the EIA organization, each pollutant of the Project would reach the emission standard before being discharged, and the impacts of the Project on the environment would be minimized as much as possible.</p> <p>The public express consent.</p>
	After completion of first draft of environmental impact report	<p>The participants in the meeting express support for the project construction.</p> <p>Due considerations should be given to addressing the local surplus labor.</p>	<p>The construction organization expresses that after the project completion, priority would be given to employment of local surplus labor under the same conditions.</p> <p>The public are satisfied.</p>
		<p>100% of people think the environmental impact analysis for the Project is reasonable; 100% of people agree or basically agree on the environmental pollution mitigation measures taken for the Project; 100% of people express support for the project construction.</p> <p>The surplus labor should be addressed, with certain compensation for the villagers regarding land acquisition.</p>	<p>The EIA organization expresses to strictly abide by the measures in the environmental management plan for the Project to ensure that the environmental impacts of the Project would be mitigated to an acceptable degree. The construction organization expresses that reasonable compensation would be given for land acquisition according to relevant provisions of China.</p> <p>The public are satisfied.</p>
	Before completion of EIA outline	<p>① The adoption of cash compensation for temporary occupation of land is preferred.</p>	<p>The investigation team feeds the public opinions back to the project implementer. The unit expresses that the compensation standard for land acquisition would be implemented in strict accordance with the documents issued by the state and Chongqing Municipality and that the means of cash</p>

		<p>② It is hoped that the compensation policy standard for the Project can be implemented according to the spirit of documents issued by the state and Chongqing municipality.</p>	<p>compensation would be adopted.</p> <p>The investigated public are satisfied.</p>
		<p>100% of people wish to see the project construction, with support for the project construction.</p> <p>35.3% of farmers are unaware of the policies related to land acquisition for the Project, and 41.0% of people do not know how to complain if treated unfairly during land acquisition.</p>	<p>The personnel of project office and investigation team have publicized relevant laws, regulations and policies extensively.</p> <p>All the interviewees have learned that they could make an appeal through legal complaints mechanism when their lawful rights and interests are infringed upon.</p>
		<p>① They wish the Project would be completed as soon as possible.</p> <p>② Land acquisition, relocation and resettlement should be carried out properly to ensure that the living standards of affected population shall not be reduced.</p> <p>③ The safety of pedestrians nearby should be ensured during construction.</p> <p>④ The farmers losing land and the villagers whose land is requisited should be helped with employment.</p> <p>⑤ Importance should be attached to environmental protection to prevent the water sources and farmland in the villages from pollution.</p> <p>⑥ The compensation standard should be raised as much as possible; the compensation cost should be reasonable and distributed to the recipients in time; the compensation information should be public and transparent.</p> <p>⑦ It is recommended that the Owner should often communicate with the villagers to avoid conflicts.</p>	<p>The EIA organization feeds relevant opinions back to the project implementer and government agencies. The project implementer promises to prepare the reasonable compensation standard, give priority to employment of local labor under permissible conditions, conduct civilized construction according to relevant regulations, protect the local land and environment, and adequately communicate with the villagers in the process of land acquisition, achieving the villagers' satisfaction with compensation. It is also stated that for the environmental protection issue, a series of protective measures would be taken in the EIA to ensure that the environmental impacts would be within the acceptable range.</p> <p>The investigated public are satisfied.</p>
		<p>All the participants in the meeting express support for the project construction, wishing to accelerate the Project.</p>	<p>The construction organization expresses that they would make all preparations as soon as possible and strive to complete the Project as early as</p>

			possible. The public are satisfied.
		98.9% of people think that the Project will play a good role in flood control, reduction of water pollution load, and socioeconomic development whereas the rest of them think otherwise. The project is helpful for the local economic development as 89.3% of people think that the Project will benefit the villagers. Construction should be conducted reasonably. The traffic jam and safety issue caused during construction period.	The construction organization expresses that they are bound to complete the engineering task with both quality and quantity assured to live up to everyone's expectations. The qualified contractor would be selected for construction, the implementation would be in strict accordance with measures in the environmental management plan, and the construction would be carried out according to regulations to ensure safety. The construction vehicles would stagger rush hours to avoid traffic jams. Upon explanation, the public express that it is understandable.
	After completion of first draft of environmental impact report	All the participants in the meeting express support for the project construction, wishing that the Project would be completed as soon as possible.	The construction organization expresses that they would handle all procedures as soon as possible and strive to complete the Project as early as possible. The public are satisfied.
		100% of people think that the environmental impact analysis for the Project is reasonable; 100% of people think that the environmental impact mitigation measures for the Project during construction period are feasible or basically feasible. Attention should be paid to safety issue during construction period.	The construction organization expresses that they would implement the civilized construction according to the regulations of China, reasonably plan the routes for construction transport vehicles, and ensure the safety of passers-by. The public are satisfied.
Shizhu component	Before completion of EIA outline	① The adoption of cash compensation for temporary occupation of land is preferred. ② It is hoped that the compensation policy standard for the Project can be implemented according to the spirit of documents issued by the state and municipality.	The investigation team feeds the public opinions back to the project implementer. The unit expresses that the compensation standard for land acquisition would be implemented in strict accordance with the documents issued by the state and Chongqing Municipality and that the means of cash compensation would be adopted. The investigated public are satisfied.

	<p>100% of people wish to see the project construction; 100% of people think the Project would benefit the villagers.</p> <p>25.8% of farmers are unaware of the policies related to land acquisition for the Project, and 41.5% of people do not know how to complain if treated unfairly during land acquisition.</p>	<p>The personnel of project office and investigation team have publicized relevant laws, regulations and policies extensively.</p> <p>All the interviewees have learned that they could make an appeal through legal complaints mechanism when their lawful rights and interests are infringed upon.</p>
	<p>① They wish the Project would be completed as soon as possible.</p> <p>② Land acquisition, relocation and resettlement should be carried out properly to ensure that the living standards of affected population shall not be reduced.</p> <p>③ The safety of pedestrians nearby should be ensured during construction.</p> <p>④ The farmers losing land and the villagers whose land is requisited should be helped with employment.</p> <p>⑤ Importance should be attached to environmental protection to prevent the water sources and farmland in the villages from pollution.</p> <p>⑥ The compensation standard should be raised as much as possible; the compensation cost should be reasonable and distributed to the recipients in time; the compensation information should be public and transparent.</p> <p>⑦ It is recommended that the Owner should often communicate with the villagers to avoid conflicts.⑧ They are concerned about the agricultural use of dredged sludge and the accumulation of heavy metals in urban greening, and are opposed to the two disposal schemes, and support the sanitary landfill scheme for the dredged sludge.</p>	<p>The EIA organization feeds relevant opinions back to the project implementer and government agencies. The project implementer promises to prepare the reasonable compensation standard, give priority to employment of local labor under permissible conditions, conduct civilized construction according to relevant regulations, protect the local land and environment, and adequately communicate with the villagers in the process of land acquisition, achieving the villagers' satisfaction with compensation. It is also stated that for the environmental protection issue, a series of protective measures would be taken in the EIA to ensure that the environmental impacts would be within the acceptable range.</p> <p>The public are satisfied.</p>
	<p>① All the participants in the meeting express support for the project construction, wishing to accelerate the</p>	<p>The construction organization expresses that they would make all preparations as soon as possible and strive to start and complete the Project as early</p>

	<p>Project.</p> <p>② The project is good and beneficial to the people. It is hoped that the Project would start as soon as possible.</p>	<p>as possible.</p> <p>The participants in the forum are satisfied.</p>
	<p>① 42.9% of people think that the predominant pollution is noise whereas 38.0% of people think it is dusty. They hoped that everyone's life and rest would not be disturbed during construction period.</p> <p>② The public are concerned about the whereabouts of sludge, afraid that the sludge returned to farmland may pollute the soil.</p> <p>③ As ordinary highways would be crossed in the pipe network works, traffic management department expresses that neither the highways shall be damaged nor the travel of residents shall be affected.</p>	<p>The EIA organization expresses that the means of watering for dust suppression and covering would be adopted for construction dust, the operation of construction machinery would stagger the rest time of residents, and the impacts on everyone would be minimized as much as possible. In addition, the construction period would be temporary and last for a short time.</p> <p>Heavy metals might be present in the dredging sludge, so the EIA organization required that all the dredging sludge should be delivered to landfill.</p> <p>Upon explanation, the public are satisfied.</p> <p>The construction organization promises to apply the mature and reasonable pipeline crossing process to ensure safety in crossing roads. Traffic management department is satisfied.</p>
After completion of first draft of environmental impact report	<p>All the participants in the meeting express support for the project construction, wishing that the Project would be completed as soon as possible.</p>	<p>The construction organization expresses that they would handle all procedures as soon as possible and strive to complete the Project as early as possible.</p> <p>The public are satisfied.</p>
	<p>100% of people think that the environmental impact mitigation measures for the Project during construction period are feasible or basically feasible; 100% of people agree or basically agree on the environmental pollution mitigation measures taken for the Project.</p> <p>The construction should be accelerated to bring benefits to common people.</p>	<p>The construction organization expresses that they would handle all procedures as soon as possible and strive to complete the Project as early as possible.</p> <p>The public are satisfied.</p>

Table 11-5 Summary Sheet of Public Consultation Related to Physical Cultural Resources

Items	Round No.	Physical Cultural Resources	Questions or Opinions of the Public	Explanatory Replies to Opinions of Departments and Experts and the Effects
Tongnan component	Round 1	National protected cultural relic -- Giant Buddha Temple	<p>① Head of Bureau of Culture, Broadcasting, Television, Press and Publication of Tongnan County expresses that the project construction should be subject to consent of competent department for cultural heritage in Chongqing.</p> <p>③ Chongqing Municipal Administration of Cultural Heritage agrees on the project construction on condition that relevant provisions are enforced.</p>	<p>The construction organization expresses that they would strictly abide by the document, <i>Comments on the Feasibility Study Report of Water Environment Protection and Flood control Revetment Integrated improvement Works for Dafuba Reaches in Tongnan County</i> issued by Chongqing Municipal Administration of Cultural Heritage (YWW [2013] No. 274).</p> <p>The Owner expresses that opinions of relevant departments would be sought.</p> <p>The interviewees are satisfied.</p>
	Round 2		<p>Relevant personnel of Chongqing Municipal Administration of Cultural Heritage, Government of Tongnan County, Bureau of Culture, Broadcasting, Television, Press and Publication and Land Resources and Housing Management Bureau accept the impact analysis for Giant Buddha Temple and the impact mitigation measures taken in the EIA for the Project.</p>	<p>Relevant organizations have given an official written reply on the Project.</p>

Rongchang component	Round 1	Municipal protected cultural relic -- Darong Bridge	① The Command Department for Laixi River Integrated improvement Works in Rongchang County reports to Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County on the proposed protective measures in the project construction, and asked for its instructions and opinions. The bureau considers them acceptable.	The construction organization expresses that they would strictly abide by relevant requirements in <i>Reply Letter on the Protection Scope of Cultural Relics Involved by Laixi River Integrated improvement Works</i> (RWGXH [2013] No.112) issued by Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County. The interviewed organizations are satisfied.
	Round 2		Relevant personnel of Government of Rongchang County, Bureau of Culture, Broadcasting, Television, Press and Publication and Land Resources and Housing Management Bureau accept the impact analysis for Darong Bridge and the impact mitigation measures taken in the EIA for the Project.	Relevant organizations have given an official written reply on the Project.
Pengshui component	Round 1	Municipal protected cultural relic -- Xujiaba Site	① Head of Bureau of Culture, Broadcasting, Television, Press and Publication of Pengshui County express that the project construction should be subject to consent of competent department for cultural heritage in Chongqing. ③ Chongqing Municipal Administration of Cultural Heritage agrees on the project construction on condition that relevant provisions are enforced.	The construction organization expresses that they would strictly abide by the document, <i>Reply on Approval of Flood control Revetment and Integrated improvement Works for Riverside Section of Wujiang River in Dianshui New Town, Pengshui County</i> (YWW [2013] No.239) issued by Chongqing Municipal Administration of Cultural Heritage. The Owner expresses that opinions of relevant departments would be sought. The interviewees are satisfied.

	Round 2		Relevant personnel of Chongqing Municipal Administration of Cultural Heritage, Government of Pengshui County, Bureau of Culture, Broadcasting, Television, Press and Publication and Land Resources and Housing Management Bureau accept the impact analysis for Giant Buddha Temple and the impact mitigation measures taken in the EIA for the Project.	Relevant organizations have given an official written reply on the Project.
--	---------	--	---	---

Table 11-6 Summary Sheet of Public Consultation Related to Natural Habitats

Items	Round No.	Natural habitat	Questions or Opinions of the Public	Explanatory Replies to Opinions of Departments and Experts and the Effects
Tongnan component	Round 1	Huangjiaotang spawning ground and Xibutang spawning ground	<p>① The villagers of Xinsheng Village and Shengli Village along the route of Project express that both species and quantity of the fish in Fujiang River have decreased severely.</p> <p>② Head of Agricultural Committee of Tongnan County expresses that, as the two spawning grounds belong to ordinary fish spawning grounds, the project construction shall neither be conducted within protection areas of the spawning grounds nor have obvious adverse impacts on the spawning grounds.</p> <p>③ The expert of Fisheries College of Southwest University expresses that, as Xibutang spawning ground is located at project section downstream, attention should be paid to protecting the spawning ground during construction.</p>	<p>After communicating with the Owner, the EIA organization expresses that they would strictly abide by the local and national laws and regulations. The construction of dyke would be conducted during low-water period without construction diversion and river closure, the main embankment works would not involve underwater construction, and the spawning grounds would be protected at all times.</p> <p>The interviewees are satisfied.</p>
	Round 2		In consultation with the expert of Fisheries College of Southwest University and Head of Agricultural Committee of Tongnan County, they accept the conclusions of the environmental	The relevant organizations are satisfied.

			impacts on the spawning grounds drawn in the EIA and the protective measures in the EIA.	
--	--	--	--	--

11.4 Information Disclosure

Information disclosure for the Project is divided into two rounds. The first round is implemented soon after screening environmental issues by combining the Project and the specific environmental analysis, by means of online publicity and publicity by posting. The second round is implemented after completion of the first draft of EIA. The full texts of the EIA report and the first draft of environmental management plan are placed in relevant village committees, subdistrict offices and management committees with convenient access for the public. Meanwhile, announcements are published in the local newspapers to notify the public that they could learn about the Project by reading full texts of the EIA report and the environmental management plan publicized online and could also refer to the texts in time and conveniently at nearby places and make their own comments. The EIA organization would collect feedback information and respond at the above sites where information is disclosed and publicized. Refer to Table 11-7 for the summary of information disclosure for the Project.

Table 11-7 Summary of Information Disclosure for the Project

Items	Round No.	Approaches	Dates	Places/Websites
General report		Online publicity	2014.3.8~	http://www.eiafans.com/forum.php
		Publicity on newspaper	2014.3.9~	Chongqing Daily News
Tongnan component	Round 1	Publicity by posting	2013.5.9~	Shengli Village, Qianjin Village, Xinsheng Village, and Shinian Village
		Consultation & interview	2013.5.9~	Agricultural Committee of Tongnan County, Management Committee of Giant Buddha Temple Scenic Spot, and Zitong Subdistrict Office
	Round 2	Publicity on newspaper	2013.10.9~	Tongnan Daily News
		Online publicity	2013.8.29~	Tongnan County Water Authority Website http://www.cqtnsl.com/view.asp?id=1366
		Placement of documents in village committees	2013.10.29~	Shengli Village, Qianjin Village, Xinsheng Village, and Shinian Village Committees
Rongchang component	Round 1	Publicity by posting	2013.8.12~	Wanling Town, Changzhou Subdistrict Office
		Consultation & interview	2013.8.15~	Chongqing Municipal Administration of Cultural Heritage, Bureau of Culture, Broadcasting, Television, Press and Publication of Rongchang County, Darongzhai Community, and Changzhou Subdistrict/Village
	Round 2	Online publicity	2013.10.18~	http://www.cqmsy.com
		Placement of documents in village	2013.10.30~	Government of Wanling Town, and Changzhou Subdistrict Office

		committees		
		Public participation in forum	2013.11.19~	Baochengsi Village Meeting Room, and population-centralized settlements in Darongzhai Community
Pengshui component	Round 1	Online publicity	2013.8.26~	Website of Government of Pengshui County http://ps.cq.gov.cn/hdjl/
		Public participation in forum	2013.8.20~	Government of Pengshui County
		Publicity by posting	2013.8.27~	Linjiang Community, Zhangjiaba Community and so on
	Round 2	Online publicity	2013.11.13~	Website of Government of Pengshui County http://ps.cq.gov.cn/hdjl/
		Placement of documents in village committees and management committees	2013.11.15~	Management Committee of Dianshui New Town, Linjiang Community and Zhangjiaba Community and other communities
		Public participation in forum	2013.11.18~	Pengshui County Water Authority
Shizhu component	Round 1	Online publicity	2013.8.20~	http://www.eiafans.com/forum.php
		Publicity by posting	2013.8.22~	Shuangqing Community, Hongjing Community, and Hongxing Community
	Round 2	Online publicity	2013.10.23~	http://www.eiafans.com/forum.php
		Placement of documents in village committees	2013.11.17~	Village Committees of Shuangqing Community, Hongjing Community, and Hongxing Community
		Public participation in forum	2013.11.20~	Government of Shizhu County

In the information disclosure, what is publicized in the first round includes the project basics (name, site, scale, content, potential impacts, mitigation measures, scope of service, construction scheme, and route map of the Project), the working procedure and main work of the EIA, the main issues on which public opinions are to be sought, the feedback system of the public's opinions, and the contact details of relevant departments.

The second round of information disclosure mainly conveys that, as the preparation of the EIA report has been completed, the public could refer to the full text at website or village committee, and directly feed back information, such as opinions and suggestions, online or by telephone and fax.

12 Environmental Management Plan

12.1 Objectives of Environmental Management Plan (EMP)

The objectives of environmental management are to achieve the expected environmental goals by means of planning, organization, coordination, control, and supervision, ultimately realizing mitigation of adverse impacts and improvement of positive impacts. The environmental protection awareness of all the staff would be improved by carrying out the environmental management to promote enterprises' active prevention and treatment of pollution and avoid possible environmental pollution due to poor management.

12.2 Content of EMP

The effective environmental management plan is developed by adequately understanding the characteristics of the Project during its implementation based on identification of weak links in the environmental management. The environmental management plan applies to the whole process of the project establishment, including establishment of management organization, and pre-construction period, construction period and operation period of the Project. The environmental management plan mainly comprises the environmental management system, the environmental management organization, the environmental management training, the environmental management regulation, the environmental monitoring and water & soil control monitoring program, and the environmental protection cost estimate and etc.

12.3 Environmental Management System

The environmental management system of Chongqing Small Town Water Environment Improvement Project under World Bank Loan is divided into external management and internal management, and management is performed during pre-construction period, construction period, and operation period.

(1) External management: The management is implemented by the environmental protection administrative departments at all levels and the World Bank. On the basis of the World Bank's requirements and relevant laws and regulations of China, corresponding standards and requirements that should be met for the environmental protection of the construction project are identified, and the supervision and inspection at all stages as well as acceptance of the completed environmental protection works are undertaken.

(2) Internal management: The project implementer is responsible for its organization and implementation and for the optimization, organization and implementation of environmental protection measures for the Project, ensuring that the management reaches the environmental protection requirements by the World Bank and the national and local environmental protection departments. The internal environmental management system for the Project is performed at different levels by implementer, the Supervision Engineer, contractor, and monitoring unit.

12.3.1 Environmental Management System during Pre-construction Period of the Project

The environmental management during pre-construction period of the Project is mainly organized and implemented by Chongqing Municipal Management Office for the World Bank's Capital Utilization, coordinated by each component organization, EIA organization and design institute, and supervised by Chongqing Environmental Protection Bureau, the Environmental Protection Bureaus of cities and counties where components are implemented, and the World Bank.

12.3.2 Environmental Management System during Construction Period

Refer to Figure 12-1 for details of the environmental management system during construction period of the Project, and refer to Table 12-1 for responsibilities of all organizations in the management system.

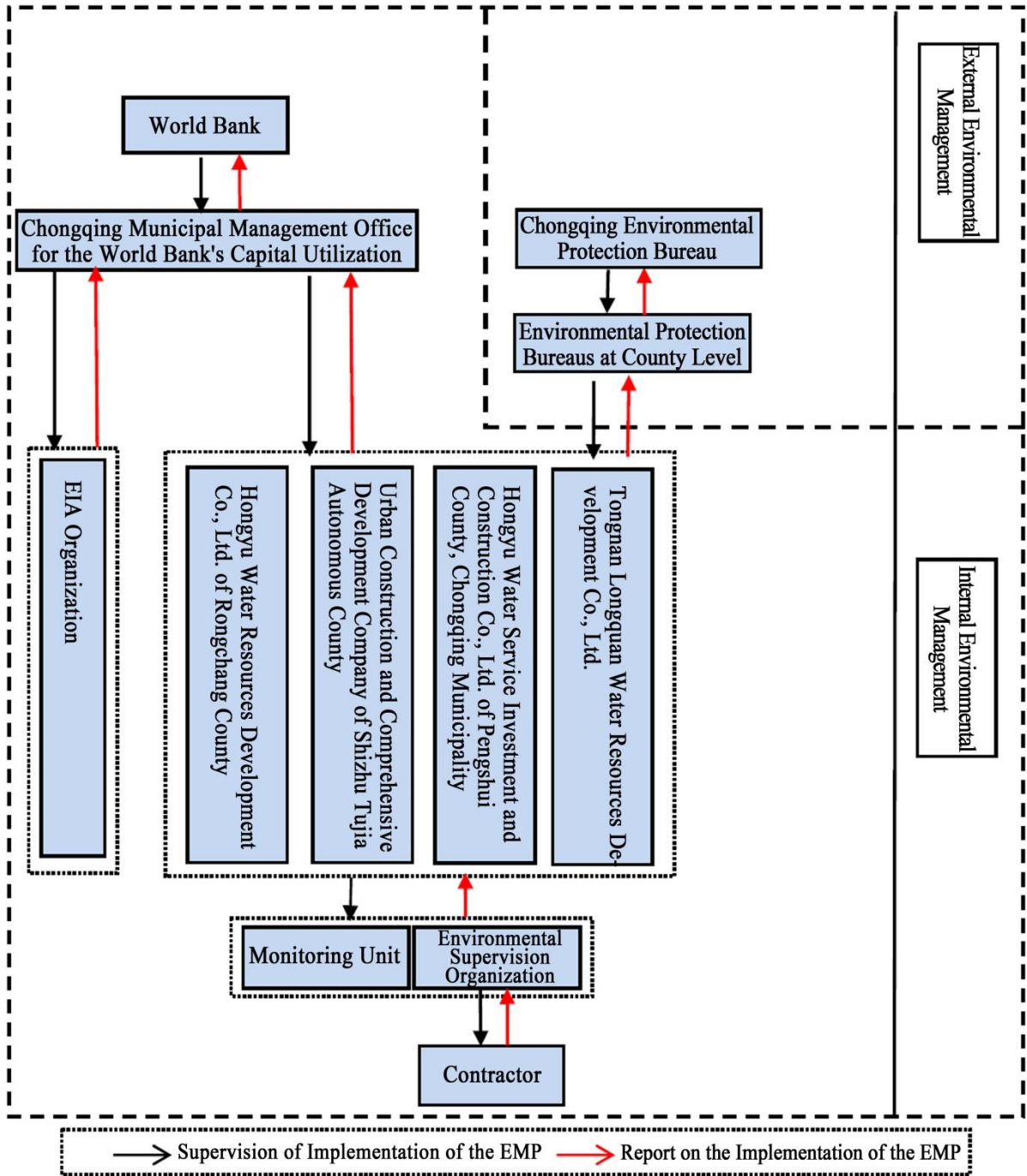


Figure 12-1 Diagram of Environmental Management System during Construction Period

Table 12-1 Organizations in the Environmental Management System during Construction Period and Their Responsibilities

Nature of Organizations		Names	Responsibilities
External environmental management	Supervision organizations	Chongqing Environmental Protection Bureau	For operational guidance and supervision & administration of environmental protection bureaus at county level
		Environmental Protection Bureaus at County Level	For supervision & administration of matters related to of the Project and matters related to the examination & approval, acceptance and environmental protection of components
		World Bank	For periodical supervision and inspection of implementation of the environmental management plan during construction period
Internal environmental management	Management organizations	Chongqing Municipal Management Office for the World Bank's Capital Utilization	For coordination and management of the Project, including the environmental management and environmental supervision of all components, and for supervision and inspection of implementation of the environmental management plan, ensuring that the environmental protection measures proposed for the Project are included in the bidding documents and the civil engineering contract.
		Component Implementer	As the project implementer, responsible for supervision and management of the environmental protection management work during construction period from construction commencement till completion acceptance, bearing the responsibility for environmental protection management of the Project. Responsible for coordination and management of all components, including the daily environmental management of the Project, and for supervision and inspection of implementation of the environmental management plan during construction period
	Environmental management implementers	Contractor	As the implementer, responsible for implementation of the environmental protection measures during construction period
	Consulting services	Environmental Supervision Organization	For review of the environmental protection plan submitted by the civil construction contractor and related costs; for review of civil engineering contract and supervision the Owner's preparation of environmental protection requirements in the contract, including related costs and penalty causes; for report of the environmental management during construction period to relevant departments and recommendation of solutions and suggestions for existing problems; for curbing the actions causing damage to the environment and going against the environmental protection regulations and for punishment according to the contract.
		Environmental	Commissioned by owners of the components to undertaking

		monitoring agency	the professional environmental monitoring task
		EIA Organization	Commissioned by the implementer to providing consulting service for issues arising out of environmental management

12.3.3 Environmental Management System during Operation Period

Refer to Figure 12-2 for details of the environmental management system during operation period of the Project, and refer to Table 12-2 for responsibilities of all organizations in the management system.

Table 12-2 Organizations in the Environmental Management System during Operation Period and Their Responsibilities

Nature of Organizations		Names	Responsibilities
External environmental management	Supervision organizations	Chongqing Environmental Protection Bureau	For operational guidance and supervision & administration of environmental protection bureaus at county level
		Environmental Protection Bureaus at County Level	For supervision and management of matters related to environmental protection during operation period of the Project
		World Bank	For periodical supervision and inspection of implementation of the environmental management plan during operation period
Internal environmental management	Management organizations	Chongqing Municipal Management Office for the World Bank's Capital Utilization	For supervision and management of environmental protection during operation period of the Project
		Owners of the components	For supervision of the environmental protection management during operation period of the Project, bearing the responsibility for environmental protection management of the Project
	Environmental management implementers	Rongchang Urban Utilities and Landscaping Bureau, and Government of Longkong Town	For implementation of environmental protection during operation period (pump station)
		Shizhu Urban Utilities Bureau	
Consulting services	Environmental monitoring agency	Commissioned by the project implementer, responsible for all the environmental monitoring during operation period of the Project and for preparation of environmental monitoring report	

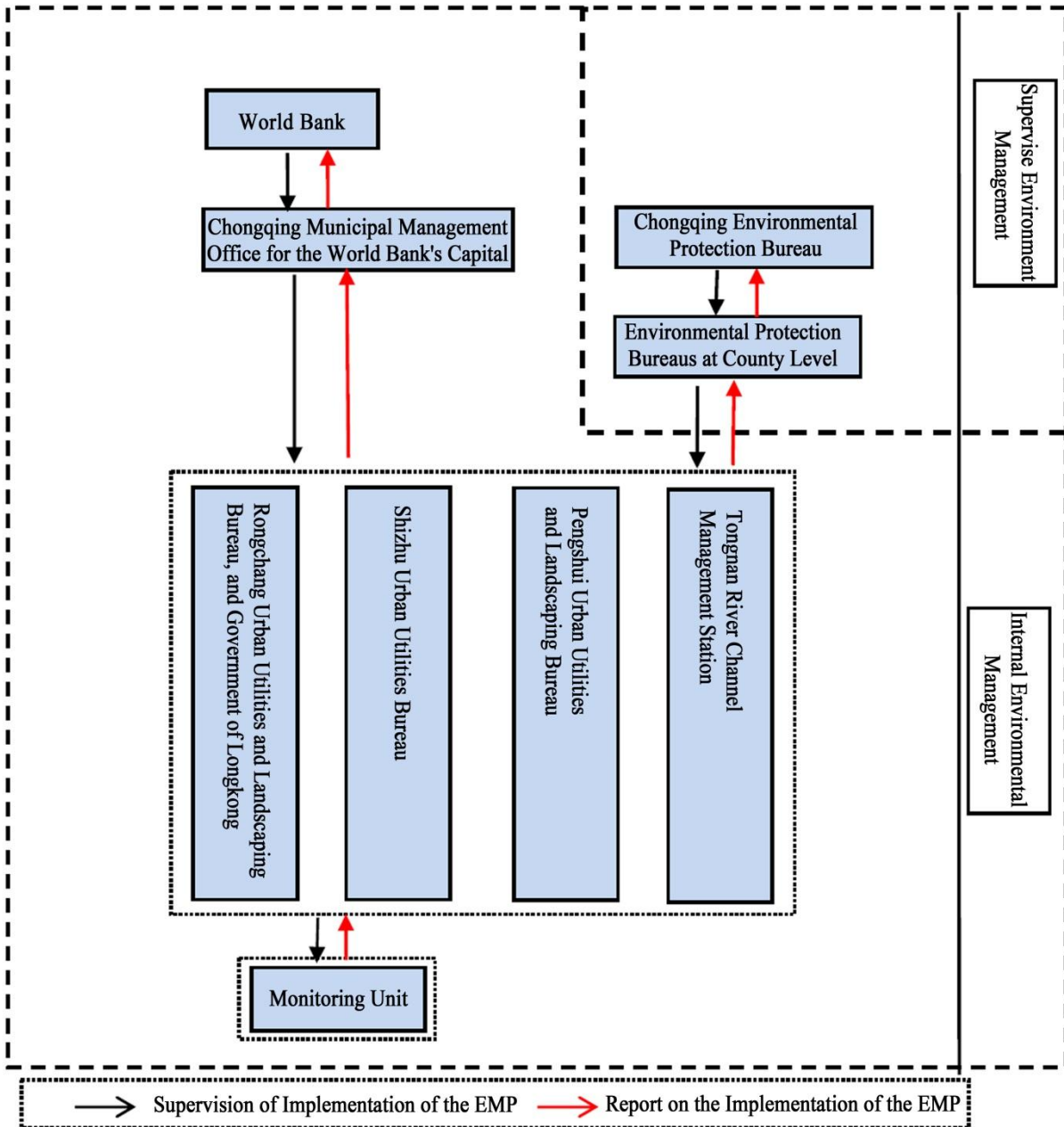


Figure 12-2 Diagram of Environmental Management System during Operation Period

12.4 Environmental Management Organizations

12.4.1 Environmental Supervision Organizations

The World Bank, Chongqing Environmental Protection Bureau and Environmental Protection Bureau of various counties jointly form the external environmental management organizations of the Project.

The environmental protection departments at all levels are the environmental administrative authorities. They should conduct environmental supervision and management for the whole process of the Project, involving approval of EIA report for the Project, final acceptance of environmental protection works during construction period, and environmental supervision & management during operation period and other phases. The World Bank supervises and inspects the environmental management of the Project during the whole process.

12.4.2 Environmental Management Organizations

12.4.2.1 Environmental Management Organizations during Pre-construction Period

Organization and personnel: During pre-construction period of the Project, Chongqing Municipal Management Office for the World Bank's Capital Utilization is the main organization of environmental management. In the pre-construction period, Chongqing Municipal Management Office for the World Bank's Capital Utilization should designate an environmental protection officer to be responsible for environmental protection and coordination in the stage.

Competency requirements: The environmental protection officer should graduate from environmental protection major or environmental management major and related majors, have been trained in environmental management, and have similar experience in environmental management of the Project.

Responsibilities: entrust EIA organization to prepare EIA statement; conduct EIA during construction period and operation period of the Project; propose various environmental protection measures; put the measures proposed by EIA into design document through design institute; and include the investment of environmental protection works in project budget.

12.4.2.2 Environmental Management Organization during Construction Period

During construction period, environmental management is mainly performed by project office, the Supervision Engineer and the Contractor. They should be supervised and inspected by the World Bank, Chongqing Environmental Protection Bureau and the Environmental Protection Bureaus of counties where components are located. The Contractor should implement various environmental protection measures during

construction period, with the cooperation of and services provided by EIA organization and monitoring unit. The Supervision Engineer should conduct overall supervision and inspection for the implementation and effect of the Contractor's environmental protection measures.

(1) Chongqing Municipal Management Office for the World Bank's Capital Utilization and the owners of components

☐ Chongqing Municipal Management Office for the World Bank's Capital Utilization

Organization personnel: During the construction period of the Project, Chongqing Municipal Management Office for the World Bank's Capital Utilization should designate an officer to be fully responsible for environmental management and supervision of the period.

Competency requirements: The environmental protection officer should graduate from environmental protection major or environmental management major and related majors, have been trained in environmental management, and have similar experience in environmental management of the Project.

Responsibilities:

① Be responsible for reporting to the World Bank; implement the World Bank's suggestions about EMP of the Project.

② Be responsible for reporting to governmental administrative authorities; coordinate with other related departments to solve environmental problems.

③ Supervise the implementation of environmental protection measures required by EIA.

④ Organize and implement the environmental management training plan of the Project.

⑤ Submit report (statement) to environmental management department annually.

⑥ Assist the consultation organizations including EIA organization to carry out relevant work.

⑦ Cooperate in environmental inspection (including the inspection by the World Bank).

⑧ Ensure that the environmental protection measures proposed for the Project are included in the Bidding Documents and civil engineering contract.

☐ Owners of the components

Organization personnel: Each implementer should designate a full-time environmental protection officer to be responsible for environmental management and supervision during the construction period of the components.

Competency requirements: The environmental protection officer should graduate from environmental protection major or environmental management major and related majors, have been trained in environmental management, and have similar experience in environmental management of the Project.

Responsibilities:

① Be responsible for reporting to Chongqing Municipal Management Office for the World Bank's Capital Utilization; implement the World Bank's suggestions about EMP of each component.

② Prepare and implement environmental management rules and regulations for each component; conduct daily environmental management for those components.

③ Be responsible for reporting to governmental administrative authorities; coordinate with other related departments to solve environmental problems.

④ Ensure the implementation of environmental protection measures required by EIA for each component.

⑤ Ensure that the environmental protection measures proposed in EMP are included in project construction contract.

⑥ Invite, supervise and coordinate with environmental supervisor (qualification, responsibility and management).

⑦ Assist the consultation organizations including EIA organization to carry out relevant work.

⑧ Be responsible for recording and sorting out the complaints made during construction and operation period of the Project; reporting to Chongqing Municipal Management Office for the World Bank's Capital Utilization; explaining the disposal results to the public and solving the public petition issues.

⑨ Review environmental supervision and monitoring reports.

⑩ Cooperate in environmental inspection (including the inspection by the World Bank).

⑪ Other work, like document management, coordination between departments, publicity, reporting, etc.

(2) Environmental supervision

Environmental supervision engineer: For each component of the Project, environmental supervision engineer should be employed to supervise the environment for components.

Competency requirements: The environmental supervision engineer should have been trained in environmental protection, should receive the environmental management training for the Project, and be qualified in environmental management.

Responsibilities:

- ① Fill in environment checklist.
- ② Be responsible for completing environmental supervision- & inspection-related environmental reports; implement the mitigation measures for environmental impacts during construction period.
- ③ Supervise and inspect the domestic sewage collection and treatment, production wastewater treatment and water & soil loss prevention measures, exhaust gas, dust & noise control measures, and production & domestic wastes and assanation, etc., in the construction area.
- ④ Propose solution for environmental protection-related problems encountered by the Contractor during construction.
- ⑤ Make sure that the Contractor will prepare and submit monthly report on environment.
- ⑥ Check the monthly report on environment; propose official or unofficial disposal suggestions with respect to various problems arising in work. Communicate and coordinate with the Contractor through the Engineer of the Project, if necessary.
- ⑦ Observe the impact of construction on the population around the construction area; make sure whether the Contractor should take additional protective measures. If the Contractor fails in taking proper measures, fine penalties should be imposed.

The Scope of the service also includes:

1. supervision on the environmental works and environmental compliance;
2. Review the environmental works in the preliminary design;
3. Keep the journal of supervision and record of the site inspection;

4. submit the daily report, conclusion report and environmental accident reports;
5. hold environmental meetings (initial meeting, regular meeting, and topic meeting);
6. keep the files on the daily supervision;
7. supervise the progress of the implementation of the environmental works and the signature the investment on the environmental works;
8. invite environmental experts to inspect the sites.

(3) The Contractor

Personnel: For each contract, two full-time or part-time persons should be allocated to conduct environmental protection during construction period.

Competency requirements: The technicians, who were trained in environmental protection and have certain environmental management capacity, are preferred. Additionally, they should receive the environmental management training of the Project.

Responsibilities:

- ① Develop environmental protection plan.
- ② Inspect environmental protection facility's construction progress, quality and operation; handle the problems arising during implementation.
- ③ Communicate and consult with the population in the project area during construction; set up bulletin board to inform the public of the detailed construction and time. Also, provide the contact person and contact information, so that the public can supervise the construction.
- ④ Check the utilization of annually environmental protection funds.
- ⑤ Report the execution of environmental protection clauses included in the contract.

(4) Monitoring unit

The project office entrusts qualified environmental monitoring unit to monitor the important parameters in construction area and affected area, and to prepare monitoring report.

(5) EIA organization

Commissioned by the implementer, the EIA organization provides consulting service for issues arising out of environmental management

12.4.2.3 Environmental Management Organizations during Operation Period

During operation period, environmental management is to be implemented by administrative authorities of municipal works and river channel in various counties. At the same time, the management organization, during operation period, entrusts the environmental monitoring unit to monitor the environmental management & monitoring plans for the period proposed in EMP.

(1) Management organizations

Rongchang Urban Utilities and Landscaping Bureau, Government of Longkong Town, Shizhu Urban Utilities Bureau, Pengshui Urban Utilities and Landscaping Bureau and Tongnan River Channel Management Station.

Personnel: During operation period, the above organizations should designate an environmental protection officer to be responsible for environmental management of the components in various counties during operation period. They should be guided and supervised by Chongqing Environmental Protection Bureau, the Environmental Protection Bureaus of counties where components are located, and Chongqing Municipal Management Office for the World Bank's Capital Utilization.

Competency requirements: The environmental protection officer should have been trained in environmental management and have similar experience in environmental management of the Project.

Responsibilities:

① Be responsible for the whole environmental management of the components during operation period.

② Improve the environmental protection awareness and technical level of the administrators at all levels and workers.

③ Formulate environmental management rules and regulations for the operation period of the thermal power plant component.

④ Formulate the operation instructions of pollution prevention facilities; inspect and maintain the facilities regularly.

⑤ Cooperate with the governmental administrative authority in charge of environmental protection and the group company to conduct environmental management, supervision and inspection.

(2) Monitoring unit

The implementer entrusts qualified environmental monitoring unit to accomplish the monitoring of exhaust gas, wastewater, noise and others during operation period, proposed in EMP, and to prepare environmental monitoring report.

12.5 Education Plan for Public Awareness Raising of Environmental Protection

The project areas are in 4 counties of Chongqing Municipality, all involving new development zones of the project towns, and environmental protection awareness of people living in the project areas is still kept at a low level. To address this issue, environmental protection education, information dissemination and training need to be conducted to raise public awareness of environmental protection at the preparation stage of each project component.

Responsible organizations for the education and training: Implementation organization of each of the project components.

Supervision organizations for the education and training: Chongqing Municipal Project Management Office.

Timing of the education and training: Preparation stage of project components (before construction commencement).

Trainees of the education and training: The general public living along the project construction line and directly and indirectly affected by the Project.

Environmental protection specialists for the education and training: Specialists from the environmental protection expert pool of Chongqing and environmental specialists from the World Bank will be invited to assist in the education and training.

Material to be used for the education and training: Environmental protection laws and regulations of China and relevant policies of the World Bank.

Forms for the education and training: Training workshops combined with on-site and classroom intensive lectures.

Information dissemination: From the county government to the town/township/street communities, then to communities/village leaders, and then to the general public; distribution of printed publicity material shall also be conducted.

Education and training archiving: Public education plan and the progress report should be archived to fully reflect implementation status and results of the education and training plan.

12.6 Environmental Management Training

12.6.1 Training Purpose

Environmental management training aims to improve the environmental protection awareness of all participants; make all persons actively and effectively perform the EMP, be familiar with EMP' contents and procedures; ensure the implementation of the environmental protection measures in EMP.

12.6.2 Trainees

Trainees of environmental management training: representatives of project office, representatives of the owners, environmental supervisors, contractor representatives of the components, representatives of management organizations during operation period.

12.6.3 Training Contents

① Understanding and application of environmental policy of the World Bank, domestic environmental protection law & regulation and environmental standard.

② Environmental impact assessments and environmental management plan of the Project.??

③ Environmental management regulations of the Project, especially that for construction period.

④ Pollution control technology during operation period of the Project.

⑤ Preparation of environmental management report, environmental supervision report, environmental monitoring report and the Contractor's monthly report.

12.6.4 Training Plan

In order to ensure smooth and effect implementation of the Project, relevant personnel must be trained in environmental protection knowledge and skills. In addition to explaining the importance and implementation significance of the proposed project to all staff, specific training with different focuses should also be given to the personnel at various positions.

See Table 12-3 for details of the training plan.

Table 12-3 Training Plan for Environmental Protection Technicians

Phase of the Project	Training Organization	Personnel	Training Contents	Method	Number of People	Time (day)	Expense (RMB 10,000)
Construction period	Chongqing Municipal Management Office for the World Bank's Capital Utilization	The Contractor representative, environmental protection officer on construction site, relevant personnel from historical and cultural sites under government protection	EMP of the Project and management plan for physical cultural resources	Domestic training	2 persons for each component	2	6
	Chongqing Municipal Management Office for the World Bank's Capital Utilization	Environmental protection officer of the owners at all levels	The World Bank's environmental policy and environmental protection regulations, as well as the EMP of the Project	Domestic training	1 person for each project office	2	6
	Chongqing Municipal Management Office for the World Bank's Capital Utilization	Environmental supervisor	Environmental protection regulations, construction planning, environmental monitoring guidelines & specifications, and EMP of the Project	Domestic training	All supervisors	3	7
Operation period	Chongqing Municipal Management Office for the World Bank's Capital Utilization	Management organization at each operation period	Related monitoring & pollution control technology during operation period, EMP of the Project, and the preparation of implementation report on EMP.	Domestic training	1 person for each organization; 1 person for each branch company	1	3
Total					/	/	22

12.7 Environmental Management Regulations

Environmental management regulations cover design stage, construction period and operation period.

Implementatin of the four project components should observe environmental management regulations set for the construction, operation stages (as shown in Tables 12-4, 12-5 and 12-6).

Besides, Tongnan project component should also follow regulations defined in Table 12-7; Pengshui project component should also observe regulatiosn defined in Table 12-8; Rongchang project component should also observe regulations in Tables 12-9 and 12-11; and Shizhu project component should also abide by regulations in Tables 12-10 and 12-12.

12.7.1 Environmental Management Regulations for Construction Period and Operation Period

See Tables 12-4, 12-5 and 12-6 for details of the environmental management regulations for construction and operation periods of the Project.

Table 12-4 Summary Sheet of Environmental Management Regulations for Construction & Operation Periods of Flood Control Works

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item	
Design stage	Flood control works	Scale and route selection	Comprehensively analyze and compare scale and route selection scheme for flood control works from multiple aspects, such as environmental protection, social needs, technology & economy and project, geological exploration and local planning. Select the optimum scale and route selection scheme and submit to the governmental administrative authority of the county and the Owner of the Project for approval.	Design institute EIA organization Social impact assessment unit	The World Bank, local environmental protection bureau, and water conservancy bureau	/	/	
		Natural environment	Acoustic environment	Select optimum construction machinery, control construction time period, etc.	Design institute EIA organization	The World Bank, implementer, and local environmental protection bureau		
			Atmospheric environment	Optimize construction technology; reasonably select construction site.	Design institute and EIA organization	The World Bank, implementer, and local environmental protection bureau		
			Water environment	Reasonably select water-related construction technology; reasonably determine construction period (low-water period, storage period of upstream dam); confirm rationally dredging technology & method and time period (low-water period).	Design institute and EIA organization	The World Bank, implementer, local environmental protection bureau, and water conservancy bureau		
		Ecological environment	Avoid ecologically sensitive area for route selection whenever possible.	Design institute, EIA organization, and social impact assessment unit	The World Bank, implementer, local environmental protection bureau, and forestry bureau			

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
	Social environment	Water and soil conservation	Select optimum construction time period; reasonably select waste disposal area and material yard; etc.	Design institute and EIA organization	The World Bank and local environmental protection bureau		
		Cultural resources	Investigate the presence of cultural relics and historic sites in the project area during design; avoid and protect physical cultural resources for the route selection whenever possible.	Design institute and cultural sites authorities	The World Bank and local cultural sites authorities		
		Relocation due to land requisition	Minimize relocation during route selection; select the route with little land requisitioned and with slight impact.	Design institute and social impact assessment unit	The World Bank and implementer		

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
		Residents' living, transportation and commerce	Select reasonable route; avoid dense community.	Design institute	The World Bank and implementer		
Construction period	Flood control works Natural environment	Acoustic environment	<p>Temporary construction sites should be located at 50m outside of the sensitive areas. Proper layout should be ensured to avoid too high noise level in the local area. Construction machines should be located at the side away from the sensitive site and at the side close to the sensitive site, management buildings can be placed, so as to minimize noise level.</p> <p>Under the premise that construction demands are met, advanced equipment with low noise, vibration and energy consumption should be selected whenever possible; maintenance and service of mechanical equipment should be strengthened to keep the noise at the lowest level.</p> <p>Reasonable arrangement of construction method and time: Construction time at night is under strict control, avoiding adverse effect of night work on environment to the largest extent. Construction activity that would</p>	Implementer	Local environmental protection bureau	Qualified organization entrusted by the implementer in the form of a contract	

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
			<p>cause environmental noise pollution is prohibited during the period from 22:00 p.m. to 6:00 a.m. of the next day. If night work is unavoidable due to requirement of production process or other special requirements, the Contractor should report for approval in accordance with relevant laws and regulations within 4 days before night work. For unavoidable night work, competent municipal authorities of public utilities and urban-rural construction should issue a certificate respectively. The Contractor should post notice on site within one day before night work, informing nearby residents of relevant matters.</p> <p>Noise reduction measures should be carefully taken by the Contractor, with approved certificates for night work hung on a conspicuous location on site. Meanwhile, notice with construction cause and time should be posted on access route of residential agglomeration for publicity and explanation, trying to obtain understanding of the public and accepting supervision of the public and environmental protection law enforcement officer;</p> <p>Implementation of measures for noise reduction at the construction site: The Contractor should develop construction noise reduction scheme before construction. For construction activity to be carried out in the residential agglomerations along the route of the Project, the Contractor should post a notice at the construction site during construction to show project name, construction content, construction period, owner's contact information, contractor's name, person</p>				

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
			<p>in charge of the site and contact information, potential noise pollution and control measures to be taken. Reasonable layout of working equipment: Management of powered mechanical equipment in construction area should be strengthened, and devices to be used at a fixed place such as construction machinery should be installed at a place far away from the protected object to reduce impact of construction noise on environment. It is prohibited to carry out night work that would cause noise pollution in the residential agglomerations along the route of the Project within 15 days before and during college entrance examination and senior high school entrance examination. Environmental publicity and education for the constructors shall be strengthened to make them carefully implement all noise reduction measures and construct in a civilized manner. Under the premise that construction quality is guaranteed, construction progress should be accelerated and construction period should be minimized. The Contractor shall handle well the relationship with the residents near the construction site, especially those who live very close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p>				
		Atmospheric environment	Fence and enclosure would be provided around the work area during construction to reduce diffusivity of dust nuisance. Firm and beautiful fences with height no less than 1.8m should be provided around the construction site in series.	Implementer	Local environmental protection bureau	Qualified organization entrusted by the implementer	

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
			<p>Perform hardening of ground. Road in the construction camp, access road and construction material stockpile area must be hardened, with road surface kept clean. Facilities for car washing and drainage must be provided at access of the construction camp. Any car pulled out of the construction camp must be washed out, without flying, scattering, leaking particles and carrying soil.</p> <p>Construction should be carried out in a civilized manner, with necessary measures for dust nuisance prevention taken. For dust production point where cement is mixed, unloaded and poured, simple dustproof facilities should be provided, such as shelter workshop, dust board and water sprayer. Number of times of onsite mixing should be minimized and such work should be kept far away from the object under environmental protection. The construction site should be arranged reasonably, and all aggregates should be stacked and stored in a unified manner and covered with protective cloth. Powdery materials such as cement should be transported in bag or tanker. Transportation in bulk is prohibited. Besides, special warehouse should be set, with reliable measures for dust nuisance prevention provided.</p> <p>Water should be sprayed in the construction area to prevent dust. The Contractor should develop regulations on dust prevention by spraying water, and involved areas include working surface, road section, temporary dumping site and main road for transportation under construction as well as bare land not under construction. Frequency of water spraying</p>			r in the form of a contract	

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
			<p>should be determined by the Engineer based on site conditions and may be increased properly in case of high wind or dry weather.</p> <p>Management of transport vehicle: Cement, aggregate and other similar materials would easily generate dust nuisance. For transportation of materials that would easily scatter and leak, they must be loaded based on normative procedures. Closed transporter should be intact, neat and clean. Overloading is strictly prohibited.</p> <p>The Contractor must select the construction machinery and transportation facility conforming to relevant national sanitary standards and use high-grade fuel, so that the exhaust gas emitted meets relevant national standards. The construction machinery and transportation facility should be maintained and serviced frequently to prevent accidental leakage of gasoline and diesel.</p> <p>Mess hall is built in the living area of constructors. Fuel coal is prohibited. All the constructors would use clean energy sources such as natural gas, liquefied gas and electricity.</p> <p>The Owner should incorporate the special fund for dust nuisance control during construction into the cost estimate of the Project, and the Contractor should ensure that such special fund is used as designated.</p>				

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
		Water environment	<p>Wastewater generated from mixing of concrete should be recycled after coagulation sedimentation. Management of construction machinery should be strengthened. Such situations as escaping, running-out, dripping and leaking should be avoided as much as possible; treatment facilities including permanent car washing station, oil trap and grit chamber and so on should be provided, so that oily wastewater can be reused after treatment in the oil trap and grit chamber;</p> <p>Domestic wastewater may be used for pit toilet on the construction site, or may be treated with sanitary facilities of local farmers nearby. Feces are used for local agricultural production. Temporary pit toilet should be removed after construction, covered with quicklime and treated like sanitary landfill. Based on site conditions, vegetations can be planted after landfill.</p> <p>Materials at the construction site must be protected against rain and seepage with sufficient canvases and asphalt felts, preventing such materials from mixing with rainwater and flowing into water body.</p> <p>If construction activity is carried out near a water body, earth and rock shall not be piled up at the side closer to the water body. If such case is unavoidable, temporary retaining wall shall be constructed to prevent earth and rock from falling into Laixi river and causing impact on the water body and aquatic flora and fauna.</p> <p>Small amount of suspended sediment generated from the construction activity in cofferdam can be treated by</p>	Implementer	Local environmental protection bureau	Qualified organization entrusted by the implementer in the form of a contract	

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
			<p>sedimentation, so as to prevent suspended materials from entering other water bodies beyond the cofferdam to the largest extent.</p> <p>Construction camp should not be set near the environmental sensitive site, ensuring good cleanness & hygiene conditions on the construction camp and the sanitary safety of drinking water.</p>				
		Solid waste	<p>A small amount of disposed construction wastes generated during the demolishing of original buildings within the scope of embankment foundation should be transported to the disposal area for construction wastes designated by municipal departments. Mixture of materials stripped from the embankment and foundation earth and stones would be generated during the excavation of embankment foundation. The materials stripped from embankment foundation should be used for placement of levee slope after humus soils are removed. The foundation earthwork should be used as fill for the embankment and its land area.</p> <p>Rainproof garbage bins or cans should be provided at the construction camp to collect domestic garbage and transported to designated place to be disposed.</p> <p>The dredging sludge from Shizhu component should be transported to Yaodianzi Waste Treatment Plant operated by Limin Waste Disposal Co., Ltd. of Shizhu County for sanitary landfill.</p>	Project implementer	Local environmental protection bureau		

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
		Ecological Environment	Construction should be conducted within the acquired land area as much as possible, temporary land use and destruction to the farm land in the surrounding area should be minimized to the lowest level.	Contractor	Project implementer, local environmental protection bureau		
		Water and Soil Conservation	During construction period, proper coverage and fencing should be adopted at the temporary earth stockyard to avoid soil and water erosion.	Contractor	Project implementer, local environmental protection bureau, water resources bureau		

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
		Social Environment	<p>Cultural Resources</p> <p>During construction period, good relationship should be maintained with local residents and strict management should be exercised on construction staff, so as to avoid behaviors in conflict with customs of local residents. Construction in Lukong town of Rongchang County and in areas close to Xujiaba ruin site of Pengshui County and Dafu Temple of Tongnan County should observe regulations stated in the annex "Physical Cultural Resources Management Plan".</p>	Contractor	Project implementer, local cultural bureau		
			<p>Land Acquisition</p> <p>For permanent land occupation, feedback mechanism to hear from the impacted people is formulated for construction period.</p>				

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
		Life of Local Residents	<p>During construction period, warning sign boards should be established at the construction sites to describe main contents, duration of construction, apology to the public for inconveniences caused due to the construction, and contacts of responsible people and grievance hotline and etc.</p> <p>Considering great amount of electricity consumption during construction period, the contractor should contact relevant department in advance to define power line connection plan. Connection of temporary power line should be well prepared. In areas without adequate power and water supply capacity, improvement of power and water supply system should be done ahead of time of construction, so as to avoid abrupt cut-off of water or power supply impacting on local residents and enterprises.</p> <p>For construction in areas close to Yutongwenwu School of Tongnan County and No.1 Vocational School, Chenlin Hope School and Liren Hospital of Shizhu County, temporary bridges should be provided at places to allow for entrance and exit uses by students. Fine mesh fencing net should be established outside the scaffolds to ensure safety of pedestrians.</p> <p>Height and lighting direction of floodlights should be carefully set to avoid impacting on rest of residents during nighttime.</p> <p>Storage sites for pipes and tube stock should be properly located, being far away from schools as much as possible and piled up in order, with specially assigned staff to ensure safety.</p>	Contractor	Project implementer, local environmental protection bureau		

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
		Traffic Safety	<p>To minimize impacts of project construction on local residents and local traffic, unified traffic diversion plan should be formulated for construction period to avoid traffic congestion; if necessary, cooperation with local public traffic management department should be exercised to ensure smooth traffic and proper function of urban traffic system. Prior notification to the public via TV, radio and newspaper should be issued. Enforcement of safety rules by the drivers should be strengthened.</p> <p>All drivers of construction vehicles should have driving licenses and qualified skillfulness, and working time limit and shift schedule should be set for the drivers to avoid driving while being tired.</p> <p>Risky roads should be avoided and time periods with higher potential of accidents for the construction vehicles should also be avoided to reduce possibility of accidents.</p> <p>Regular maintenance of construction vehicles should be maintained and use of verified devices and spare parts by the vehicle manufacturer should be ensured, so that risk of serious accident due to device or spare part failure or ineffectiveness can be avoided.</p> <p>Parallel use of a road by pedestrians and construction vehicles should be avoided. If such parallel use can not be avoided, special line should be set to separate pedestrians from the construction vehicles, or specially assigned staff should take responsibility to guide traffic on the road;</p>	Contractor	Project implementer, local public traffic management department, the World Bank		

Phase of the Project	Item	Environmental Factors	Mitigation Measures	Implementer	Supervision organization	Monitoring Unit	Monitored Item
			<p>Cooperation with local communities and responsible departments should be exercised to improve road signs.</p> <p>upgrade visibility and safety level of the road, especially for the roads close to schools or with children presence. Education on traffic rules and pedestrian safety can be conducted together with local communities (e.g. education campaign in schools);</p> <p>Contact with emergency reaction department should be conducted to ensure proper rescue and first aid in case of emergency of accident;</p> <p>Maximal use and procurement of locally available material should be ensured to reduce transport distance. Facilities (such as dormitories of construction workers) should be located close to the construction site, and bus should be used to transport workers to reduce incremental traffic volume.</p> <p>Traffic control measures should be used to ensure traffic safety, together with road signs and signalmen to warn pedestrians and staff of danger.</p>				

Table 12-5 Environmental Management Regulations during Construction and Operation Periods of Wastewater Treatment Works

Phase of Works	Works	Environmental Factors	Mitigation Measures	Implementer	Supervision Organization	Monitoring Unit	Monitoring Item
Design stage	Wastewater treatment	Selection of scheme	Based on selection of pipeline route and difficulty in land acquisition, laying of wastewater pipe network and	Design institute	World Bank; project implementer		

				construction..			
		Selection of pipe network route		Pipe network route should be considered comprehensively based on several factors, such as relocation scale, investment, construction difficulty and cost of land acquisition.	Design institute	World Bank; project implementer	
	Natural environment	Acoustic environment		Pipe network route should reasonably avoid the surrounding residents, hospitals and schools, etc. in consideration of the impact of noise on them during construction.	Design institute; EIA organization	World Bank; project implementer	
		Solid waste		Backfilling of excavated earth should be considered during the design of pipe network route.	Design institute	World Bank; project implementer	
		Ecological environment		Pipe network should be arranged along the embankment and road if possible to reduce damages to farmlands, forestlands and grasslands.	Design institute	World Bank; project implementer	
	Social environment	Culture resources		During the design, investigation should be carried out on whether there are cultural relics along the pipe network route.	Design institute Cultural relics department	World Bank; local cultural relics department	
		Land acquisition and relocation		During the selection of route, land acquisition and relocation should be reduced as much as possible to reduce the impact on the lives of people.	Design institute; social impact assessment organization	World Bank; project implementer	
		Lives of residents, traffic and commerce		Inverted siphons or pipe jacking should be adopted during crossing construction. Full preparations should be made and detailed investigation on roads and various underground pipelines involved along the route should be carried out.	Design institute	World Bank; project implementer	
Construction period	Pipe network	Natural environment	Acoustic environment	Noise from the construction equipment should be lowered; the machinery and equipment should be maintained regularly to keep them in	The Contractor	The project implementer and local environmental protection bureau	

			<p>good condition and reduce noise pollution caused due to unsatisfactory operation of the equipment; regular inspection and maintenance of powered machines and equipment should be strengthened.</p> <p>Temporary construction sites should be located at 50m outside of the sensitive areas. Proper layout should be ensured to avoid too high noise level in the local area. Construction machines should be located at the side away from the sensitive site and at the side close to the sensitive site, management buildings can be placed, so as to minimize noise level.</p> <p>The speed of vehicles should be restricted after driving on the road near the sound sensitive area and blaring of horns should be reduced or forbidden.</p> <p>Construction with equipment which causes loud noises should be avoided as much as possible; the operation time should be restricted, i.e. construction at night (22:00 – 6:00 of next day) should be forbidden so as to ensure a relatively good environment for surrounding residents to rest at night; especially when passing by sensitive points along the pipes in urban area, civilized construction should be carried out, and the operation time of machinery with loud noise should be strictly controlled so as to reduce the impact of construction noise on them.</p>				
		Atmospheric	For construction materials which	The Contractor	The project implementer		

			environment	<p>tend to cause flying dust during construction, special sheds should be provided and dustproof cloth should be used to cover the raw materials.</p> <p>In case of earth works with high risk of causing dust due to dry state, water should be sprayed to control the dust and time of dust-causing operation should be shortened as much as possible. In case of wind of Beaufort scale 4 or above, earth works should be suspended and dustproof net should be used to cover the place where operation is suspended.</p> <p>Materials and garbage should be transported in sealed state and throwing in the air and rough handling should not be allowed; no spilling of materials should be ensured so as to avoid spilling along the road and reduce dust caused for the second time during transportation; after entering the sensitive areas, the vehicle should drive at a low speed so as to reduce impact on the surrounding environment.</p> <p>No construction camps should be set up and construction should rely on surrounding residential houses.</p>		and local environmental protection bureau		
			Water environment	<p>When temporary toilet is built, excrement should be covered with earth in time. After construction is finished, the excrement may be given to local fellow-villagers nearby to be used as fertilizers, and the toilet should be backfilled after treated with lime.</p> <p>The treatment of domestic wastewater generated by construction</p>				

			personnel should be included in the drainage systems of the villages where the construction personnel are.				
		Solid waste	<p>The disposed earth and stone during construction mainly come from those generated during laying of pipes and all of them should be backfilled.</p> <p>Waste materials generated during pipe construction as well as waste welding joints generated during pipe welding should be collected in a centralized way and sold and disposed in a unified manner in waste purchasing station.</p> <p>Domestic garbage collecting bin should be provided in the construction area and temporary living area; the domestic garbage should be disposed by environment sanitary authority in a unified manner after collected in a centralized way.</p> <p>The excrement from temporary toilet for construction personnel should be covered with earth in time. After construction is finished, the excrement may be given to local fellow-villagers nearby to be used as fertilizers, and the toilet should be backfilled after treated with lime.</p>	The Contractor	The project implementer and local environmental protection bureau		
		Ecological environment	Construction should be carried out within the land acquisition scope if possible and damages caused to temporary lands and farmlands and forestlands around the operation area should be reduced to the minimum.	The Contractor	The project implementer and local environmental protection bureau		
		Water and soil conservation	During construction, temporary dump area should be enclosed and	The Contractor	The project implementer, local		

			earth and stone should be covered to avoid water and soil loss.		environmental protection bureau and water conservancy bureau		
	Social environment	Culture resources	<p>During the construction, good relationship should be maintained with the local residents and local cultural practices should be followed, and construction personnel should be managed strictly to avoid behaviors which conflict with local cultural practices.</p> <p>Construction in Lukong town of Rongchang County and in areas close to Xujiaba ruin site of Pengshui County and Dafu Temple of Tongnan County should observe regulations stated in the annex "Physical Cultural Resources Management Plan".</p>	The Contractor	The project implementer and local government		
		Land acquisition and relocation	The acquired land for pipe network is for temporary use; feedback mechanism is provided during the construction to collect comments from the affected masses.	Project implementer	World Bank Local government		
		Lives of residents	<p>Notice board should be provided on the construction site to indicate the main contents of the Project and the inconveniences brought about by construction during the construction period to seek understanding of the public. Besides, there should be the name of a contact, complaint hotline, etc. indicated on the notice board.</p> <p>Since there is a high demand in electricity consumption during construction, the Contractor should contact with relevant departments in</p>	The Contractor	The project implementer and local environmental protection bureau		

			<p>advance to finalize a pipeline connection scheme and make good preparations for temporary pipeline connection; for sections with inadequate capacity locally, water and electricity pipelines should be transformed in advance to prevent the impact of temporary failures of water and electricity supplies on normal water and electricity supplies for residents, industrial and mining enterprises and government departments along the line.</p> <p>For construction in areas close to Yutongwenwu School of Tongnan County and No.1 Vocational School, Chenlin Hope School and Liren Hospital of Shizhu County, temporary bridges should be provided at places to allow for entrance and exit uses by students. Fine mesh fencing net should be established outside the scaffolds to ensure safety of pedestrians</p> <p>The floodlight for construction should be hung at such a height and in such a direction that would not affect the rest of residents at night.</p> <p>The selection of site for pipes should be designed reasonably at a place far from schools and the pipes should be stacked in order and guarded by special personnel.</p>				
			<p>Traffic safety</p> <p>To minimize the impact of project construction on the lives of urban residents and the urban traffic, the driving routes of vehicles on urban roads should be planned in a unified manner to subdivide traffic flow during</p>	The Contractor	The project implementer, local traffic safety department and World Bank		

			<p>construction to prevent traffic jams; if necessary, cooperation with public safeguard and traffic administration departments is needed to ensure smooth and normal urban traffic flow, and advance notice should be released via broadcasts, televisions and newspapers.</p> <p>Safety rules should be emphasized for drivers;</p> <p>The driving skills of drivers should be enhanced and drivers must have driving licenses.</p> <p>Driving time should be restricted and schedule of driving shifts for drivers should be prepared to avoid overwhelming tiredness.</p> <p>Dangerous roads and driving at a dangerous time of a day should be avoided so as to reduce the possibility of accidents.</p> <p>Vehicles should be maintained regularly and parts approved by manufacturers should be used to avoid serious accidents caused by equipment failure or premature failure of parts.</p> <p>Parallel use of a road by pedestrians and construction vehicles should be avoided. If such parallel use can not be avoided, special line should be set to separate pedestrians from the construction vehicles, or specially assigned staff should take responsibility to guide traffic on the road.</p> <p>Cooperation with local communities and competent authorities should be carried out to improve road</p>			
--	--	--	--	--	--	--

				<p>signs and enhance the visibility so as to improve the general degree of safety of roads, especially around schools and other areas frequented by children. Traffic education and pedestrian safety education should be provided together with local communities (for example, carrying out publicity activities at schools).</p> <p>Coordination with emergency handling personnel should be implemented to ensure that proper first aids are provided in case of accidents.</p> <p>Materials purchased locally should be used if possible to shorten the haul distance. Relevant facilities (such as dormitories for workers) should be constructed near the project site and workers should be transported with large buses to avoid increase of traffic flow;</p> <p>Safe traffic control measures should be taken and road signs and signals should be used to warn pedestrians and vehicles coming and going about the risks of dangers.</p>				
Operation period	Pipe network works	Natural environment	Acoustic environment	<p>The pump station should be arranged far from residential settlement and equipment maintenance should be strengthened.</p>	Project implementer	Local environmental protection bureau		
		Cumulative impact of risk		<p>Design of embankment works and the strength of wastewater pipe network should be strengthened.</p> <p>Inspection and maintenance should be strengthened.</p>	Project implementer	The project implementer and local environmental protection bureau		

Table 12-6 List of Regulations for Management on Water and Soil Conservation

Phase of Works	Works	Mitigation Measures	Implementer	Supervision Organization	Monitoring Unit	Monitoring Item
Construction period	Wastewater collection and treatment works and flood control works	<p>Construction process should be optimized and construction should be organized reasonably according to the design of main works so as to reduce the impact of project construction on water and soil loss to the minimum.</p> <p>Prior to project construction, the Contractor should strengthen the publicity of water and soil conservation and improve the awareness of the construction personnel in water and soil conservation.</p> <p>Signs for land acquisition boundary should be set up around the construction area; earth-stone works should be strictly controlled within the land acquisition scope to avoid enlarging the disturbed area.</p> <p>The construction period should be selected reasonably; loose ground should be exposed as less as possible; construction of civil works should avoid to be carried out in rainy season; while carrying out earth-stone works and construction in rainy season, temporary protective measures should be implemented.</p> <p>During the construction, excavation, backfilling, rolling and slope protection measures should be implemented at the same time. For transportation of earth and stone vehicles with cover should be selected to avoid dropping and loss of disposed materials.</p> <p>In terms of the protective works for slope excavation and backfilling, drainage system for</p>	The Contractor	The project implementer, local environmental protection bureau and water conservancy bureau	Qualified organization entrusted by the project implementer in the form of a contract	Monitoring of main factors affecting water and soil loss; monitoring of change in ecological environment with water and soil conservation measures in project area; dynamic monitoring of water and soil loss in project area; monitoring of control effects of water and soil conservation measures;

Phase of Works	Works	Mitigation Measures	Implementer	Supervision Organization	Monitoring Unit	Monitoring Item
		<p>slope surface and toe should be adopted in time after the slope stability reach the design standard. The principle of protecting a section after this section is constructed or used is followed.</p> <p>During construction, earth and stone for each construction zone should be allocated well. Backfilling should be carried out immediately after excavation is completed if possible. If backfilling cannot be carried out in time, protection measures for temporary stacking and storage should be implemented.</p> <p>The disposed wastes and temporarily stacked earth and stone generated during the construction should be cleared and transported in time and stacked at the dump area designated by the Owner.</p> <p>Management of implemented measures for control of water and soil loss should be strengthened by establishing effective management system to achieve effects in water and soil conservation as soon as possible.</p>				

12.7.2 Environmental Management Plan for Sensitive Sites

For environmental management plans for sensitive sites of the Project, see Table 12-7 for Tongnan flood control works, Table 12-8 for Pengshui flood control works, Table 12-9 for Rongchang flood control works, Table 12-10 for Shizhu flood control works, Table 12-11 for Rongchang sewage collection works and Table 12-12 for Shizhu sewage collection works.

Table 12-7 Environmental Management Plan for Sensitive Sites of the Project (Tongnan Flood Control Works)

Works	Objective of Environmental Protection	Measures for Mitigating Environmental Pollution	Responsible Organization	Supervision Organization
Tongnan Flood Control Works	5 households of No. 1 Community of Xinsheng Village	<p>The control of stationary and mobile noise sources should be strengthened during the construction period, and the operation time should be controlled. It shall not be allowed to carry out construction which may generate environmental noises during the period from 22:00 to 6:00 of the next day and from 12:00 to 14:00 in the day.</p>	The Contractor and Supervision Engineer	Project implementer and Environmental Protection Bureau of Tongnan County
	Yutong Culture and Martial Art School of Tongnan County	<p>The Contractor should handle well the relationship with the residents of No. 1 Community of Xinsheng Village, especially with those living very close to the regulation section, so as to avoid disputes caused by noise pollution and impacts on social stability.</p> <p>Construction equipment which causes noises should be arranged at a place 50 m away to the eastern side of the school.</p> <p>Reduction of dust by water spraying: powdery materials should be transported in sealed state and the construction site should be arranged reasonably, with the mixing plant and aggregate yard being set up in the west of the site and at a place 50m away from the environmental sensitive sites. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.</p>		
	Water intake of stand-by drinking water source of Tongnan urban area	<p>Domestic wastewater should not be directly discharged until treated using existing facilities; and construction wastewater should be reused as spraying water for dust reduction of the construction site after treated in the grit chamber instead of being discharged.</p> <p>Monitoring of Class A protection area of stand-by drinking water source should be implemented during river-involved construction.</p>	The Contractor and Supervision Engineer	Project implementer, Tax Bureau and Environmental Protection Bureau of Tongnan County
	Fujian River National Wetland Park	<p>The construction should be carried out only within the occupied land of the Project; it shall not be allowed to destroy wetlands outside of the occupied land during construction; native species commonly seen at the local sites should be adopted for restoration.</p>	The Contractor and Supervision Engineer	Project implementer and Forestry Bureau of Tongnan County
	Xibutang spawning ground	<p>For the construction of main embankment works, river-involved operation should not be involved; water bodies should not be disturbed; soil and water conservation measures should be strictly implemented; enclosing works should be done during construction; and dumping of waste soil into the river course shall not be allowed.</p>	The Contractor and Supervision Engineer	Project implementer and Agricultural Committee of Tongnan County
	Huangjiaotang spawning ground	<p>The equipment with high noise should be reasonably arranged at a place as far away as possible from the river course side.</p> <p>Construction wastewater should be reused after treated and domestic wastewater should be treated using existing facilities instead of discharged into the Fujian River.</p>		

		<p>River-involved construction should avoid the breeding season of fishes (March-May) so as to alleviate the negative impact of construction on the spawning ground.</p>		
	<p>Dafu (Giant Buddha) Temple</p>	<p>Prior to commencement of the construction, approval in writing by the Cultural Relics Protection Organization of the construction scheme should be obtained.</p> <p>The construction should only be carried out in the area within the delimited red line and any area outside of the red line shall not be excavated.</p> <p>It shall not be allowed to set up temporary construction sites in the sections near the Giant Buddha Temple; and temporarily stacked earth excavated during the construction should be covered with cloth as much as possible to avoid impacts of dust on the Giant Buddha Temple.</p> <p>For construction near the Giant Buddha Temple, Xujiaba Site, Lukong Ancient Town and Darong Bridge, specialists from the cultural relics protection organization shall be entrusted for on-site supervision and guidance. It is required to have the construction process being supervised by a qualified supervision engineer and have photos of the construction site taken and kept.</p> <p>If such circumstances as cracks or leaning of protected cultural relics in the Giant Buddha Temple are identified during construction, construction should be suspended immediately and the cultural relics protection organization should be informed in time. Construction may resume after it is ensured that no damages would be caused to the protected cultural relics in the Giant Buddha Temple by such construction.</p> <p>For construction near the Giant Buddha Temple, the construction equipment should be arranged as far away from the Giant Buddha Temple as possible, and construction operation which involves strong vibration should not be carried out near the Giant Buddha Temple. As a result, use of large machinery and equipment should be avoided in areas close to the temple and small equipment or construction by manpower should be adopted as often as possible.</p> <p>If cultural relics are discovered during the construction, construction should be suspended in strict accordance with the <i>Cultural Relics Protection Law of the People's Republic of China</i> to inform the local cultural relics protection organization and obtain approval before construction resumes.</p> <p>See the attachment <i>Physical Cultural Resources Management Plan</i> for other specific measures.</p>	<p>The Contractor and Supervision Engineer</p>	<p>Project implementer, Tongnan Administration of Culture, Radio, Television, Press and Publication and Chongqing Bureau of Cultural Relics.</p>

Table 12-8 Environmental Management Plan for Sensitive Sites of the Project (Pengshui Flood Control Works)

Works	Objective of Environmental Protection	Measures for Mitigating Environmental Pollution	Responsible Organization	Supervision Organization
Pengshui Flood Control Works	Construction period	<p>2 households of Linjiang Group 7</p> <p>3 households of Linjiang Group 8</p> <p>2 households of Linjiang Group 9</p> <p>2 households of Zhangjiaba Group 5</p> <p>The control of stationary and mobile noise sources should be strengthened during the construction period, and the operation time should be controlled. It shall not be allowed to carry out construction which may generate environmental noises during the period from 22:00 to 6:00 of the next day and from 12:00 to 14:00 in the day.</p> <p>The Contractor should handle well the relationship with the residents of Linjiang Group 7, Group 8 and Group 9 as well as Zhangjiaba Group 5, especially with those living relatively close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p> <p>The construction equipment which causes noise should be arranged at the side as far away from the residential dwellings as possible.</p> <p>Reduction of dust by water spraying: powdery materials shall be transported in sealed state and the construction site shall be arranged reasonably, with the mixing plant and aggregate yard being set up at a place far away from the environmental sensitive sites. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.</p>	The Contractor and Supervision Engineer	Project implementer and Environmental Protection Bureau of Pengshui County
		<p>Xujiaba Site</p> <p>The construction boundary should be strictly delimited in accordance with the delimited protection zone of original Xujiaba Site; construction and land occupation outside the red line shall not be allowed.</p> <p>Prior to construction of the Project, the Owner needs to delimit the protection area of original Xujiaba Site with the cultural relics protection organization and provide warning signs.</p> <p>Engineering operations such as rolling compaction, excavation, backfilling and stacking of materials should be avoided in the delimited protection zone of the original historical site. The ground environment of the area where the historical site is located shall not be changed.</p> <p>If cultural relics are discovered during the construction, construction should be suspended in strict accordance with the <i>Cultural Relics Protection Law of the People's Republic of China</i> to inform the local cultural relics protection organization and obtain approval before construction resumes.</p> <p>See the attachment <i>Physical Cultural Resources Management Plan</i> for other specific</p>		

measures.

Table 12-9 Environmental Management Plan for Sensitive Sites of the Project (Rongchang Flood Control Works)

Works	Objective of Environmental Protection	Measures for Mitigating Environmental Pollution	Responsible Organization	Supervision Organization
Rongchang Flood Control Works	Construction period	3 households of Darongzhai Community Group 7	The Contractor and Supervision Engineer	Project implementer and Environmental Protection Bureau of Rongchang County
		11 households of Darongzhai Community Group 6		
3 households of Darongzhai Community Group 5				
1 household of Yudingcun Group 8				
household of Baochengsi Group				
household of Baochengsi Group				
4 households of Shabaocun Group 1	<p>The control of stationary and mobile noise sources should be strengthened during the construction. It shall not be allowed to carry out construction which may generate environmental noises during the period from 22:00 to 6:00 of the next day and from 12:00 to 14:00 in the day.</p> <p>The Contractor should handle well the relationship with residents of the 24 households of Darongzhai Community Group 5, 6, 7 and Yudingcun Group 8, Baochengsi Group 1, 2 and Shabaocun Group 1 within 50m from the project construction site, especially with those living relatively close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p> <p>The construction equipment which causes noise should be arranged at the side as far away from the residential dwellings as possible.</p> <p>Reduction of dust by water spraying: The powdery material should be transported sealed and the construction site should be arranged reasonably, i.e. the mixing plant and aggregate yard should be provided at the side far away from the environmental sensitive sites. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.</p>			
Darong Bridge	<p>The construction methods with small vibration impact on the environment, such as artificial construction, should be adopted during the construction. Meanwhile, construction should be carried out outside the control area (with the upstream and downstream being 2m from the bridgehead and 15m from the bridge body) of the protection area of the ancient bridge.</p> <p>Prior to construction, the Owner should submit the construction scheme to the Cultural relics protection organization of the Darong Bridge for comments and approval, and construction may begin after approved.</p> <p>During the construction near the Darong Bridge, specialists from cultural relics protection organization should be employed for on-site supervision and guidance.</p> <p>The whole construction process is required to be supervised by</p>	The Contractor and Supervision Engineer	Project implementer and Rongchang Administration of Culture, Radio, Television, Press and Publication	

		<p>qualified Supervision Engineer and photos taken on the construction site are required to be kept.</p> <p>Fixed monitoring equipment should be installed at the right bank of Darong Bridge during construction. If such circumstances as cracks or leaning of protected cultural relics in the Giant Buddha Temple are identified, construction should be suspended immediately and the cultural relics protection organization should be informed in time. Construction may resume after it is ensured that no damages would be caused to the protected cultural relics in the Giant Buddha Temple by such construction</p>		
	Wanling Ancient Town	<p>The construction should only be carried out in the area within the delimited red line and any area outside of the red line shall not be excavated</p> <p>For construction near the Wanling Ancient Town, impact of strong vibration and noise on it should be avoided as far as possible. As a result, the use of large machinery and equipment should be limited as less as possible and small equipment or construction by manpower should be adopted as often as possible.</p> <p>The construction and protection measures should be strictly implemented according to the scheme approved by the cultural relics department; no construction site shall be established at this section.</p> <p>For temporarily stacked earth excavated during the construction, it should be covered with cloth as far as possible.</p> <p>During the construction near the Wanling Ancient Town, specialists from cultural relics protection organization should be employed for on-site supervision and guidance.</p> <p>The whole construction process is required to be supervised by qualified Supervision Engineer and photos taken on the construction site are required to be kept.</p> <p>If cultural relics are discovered during the construction, construction should be suspended in strict accordance with the <i>Cultural Relics Protection Law of the People's Republic of China</i> to inform the local cultural relics protection organization and obtain approval before construction resumes.</p> <p>See the attachment <i>Physical Cultural Resources Management Plan</i> for other specific measures.</p>	The Contractor and Supervision Engineer	Project implementer and Rongchang Administration of Culture, Radio, Television, Press and Publication

Table 12-10 Environmental Management Plan for Sensitive Sites of the Project (Shizhu Flood Control Works)

Works	Objective of Environmental Protection		Measures for Mitigating Environmental Pollution	Responsible Organization	Supervision Organization
Shizhu Flood Control Works	Construction period	23 households of Hongjing Community	<p>The control of stationary and mobile noise sources should be strengthened during the construction period, and the operation time should be controlled. It shall not be allowed to carry out construction which may generate environmental noises during the period from 22:00 to 6:00 of the next day and from 12:00 to 14:00 in the day.</p> <p>The Contractor should handle well the relationship with residents of the 42 households of Hongjing Community, Shuangqing Community and Hongxingcun Village within 50m from the project construction site, especially with those living relatively close to the regulation section, so as to avoid disputes caused by noise pollution and impact on social stability.</p> <p>The construction equipment which causes noise should be arranged at the side as far away from the residential dwellings as possible.</p> <p>Reduction of dust by water spraying: The powdery material should be transported sealed and the construction site should be arranged reasonably, i.e. the mixing plant and aggregate yard should be provided at the side far away from the environmental sensitive sites. All the aggregates should be stacked and stored in a unified manner and covered with protective cloth.</p>	The Contractor and Supervision Engineer	Project implementer and Environmental Protection Bureau of Shizhu County
		14 households of Shuangqing Community			
		5 households of Hongxingcun Village			
		Southwest Liren Hospital			

Table 12-11 Environmental Management Plan for Sensitive Sites of the Project (Rongchang Sewage Collection Works)

Works	Objective of Environmental Protection		Measures for Mitigating Environmental Pollution	Responsible Organization	Supervision Organization
Rongchang Sewage collection Works	CONSTRUCTION period	Brook	<p>The cofferdam construction method should be adopted.</p> <p>Construction should avoid the rainy season (May to September).</p>	The Contractor and Supervision Engineer	Project implementer and Water Affairs Bureau of Rongchang County
		Laixi River	<p>For pipe networks to pass through the river, directional drilling is adopted.</p> <p>Excess earthwork is collected and backfilled in strict accordance with the environmental management regulations. It is not allowed to stack garbage or discharge any pollutants in the river course.</p>		

Operation period		The waste mud generated during the directional drilling through the river should be backfilled together with the earthwork.		
	G85 expressway	<p>The included angle of the pipe with the expressway should not be smaller than 70°.</p> <p>The pipes should run under the expressway viaduct.</p> <p>The construction scheme should be approved by the highway administration department.</p> <p>The construction should be carried out strictly in the delimited scope according to the approved construction scheme; attention should be paid to the protection of the piers of viaduct during the construction; and any action posing harm to the piers of viaduct should be forbidden.</p>	The Contractor and Supervision Engineer	Project implementer and relevant local departments
	Above county-level highway	<p>Pipe jacking is adopted for crossing works and consent letter is received from relevant management department to avoid damages to the subgrade by the works.</p> <p>The pipelines should better be perpendicular to the highway and in case of oblique crossing, the included angle should not be smaller than 60°. Protective casings should be protected for the pipeline to pass through the highway and the strength of the casings should satisfy the highway-grade I loading requirements; the top surface of the protective casing should not be less than 1.5m away from the subbase of the highway. It is forbidden for the pipeline to cross the river by taking advantage of the highways and bridges. For the section of the pipeline parallel to the highway, the centerline of the pipeline should be kept at a safe distance of above 20m away from the side boundary of the land for highway.</p>		
	General country road	Construction is carried out by way of half breadth excavation and at a time when there is a relatively small flow of people and vehicles on the road (9:00 am to 12:00am; 2:00pm to 5:00 pm during daytime). Temporary bridges are provided during the construction period for passage of vehicles and pedestrians.		
	Pipeline	The pipelines should be inspected 4 times every month with focus on those for crossing works.		
	Pump station	<p>Submersible sewage pumps with low noise should be selected;</p> <p>Sound insulation pump houses should be provided for the pump;</p> <p>Measures for vibration reduction should be provided;</p> <p>The pump station should be inspected every day and problems discovered should be handled in time.</p>	Municipal Landscaping Administration Bureau of Rongchang County , the government of Lukong Town	Environmental Protection Bureau of Rongchang County

Table 12-12 Environmental Management Plan for Sensitive Sites of the Project (Shizhu Sewage Collection Works)

Works	Objective of Environmental Protection	Measures for Mitigating Environmental Pollution	Responsible Organization	Supervision Organization
Shizhu Sewage collection and treatment Works	Construction period	Longhe River For pipe networks to pass through the river, directional drilling is adopted. Excess earthwork is collected and backfilled in strict accordance with the environmental management regulations. It is not allowed to stack garbage or discharge any pollutants in the river course. The waste mud generated during the directional drilling through the river should be backfilled together with the dredging sludges of river course.	The Contractor and Supervision Engineer	Project implementer and Water Affairs Bureau of Shizhu County
		General country road Construction is carried out by way of half breadth excavation and at a time when there is a relatively small flow of people and vehicles on the road (9:00 am to 12:00am; 2:00pm to 5:00 pm during daytime). Temporary bridges are provided during the construction period for passage of vehicles and pedestrians.	The Contractor and Supervision Engineer	Project implementer and relevant local departments
	Operation period	Pipeline The pipelines should be inspected 4 times every month with focus on those for crossing works.	Shizhu Urban Utilities Bureau	Environmental Protection Bureau of Shizhu County
		Pump station Submersible sewage pumps with low noise should be selected; Sound insulation pump houses should be provided for the pump; Measures for vibration reduction should be provided; The pump station should be inspected every day and problems discovered should be handled in time.		

12.8 Plan for Environmental, Water and Soil Conservation Monitoring

12.8.1 Monitoring Purpose

Environmental monitoring is an important part of the environmental management work. The preparation of necessary environmental monitoring plan and strict implementation of it according to the schedule may help effectively inspect the results of the environmental management work and facilitate timely and necessary adjustment and improvement. As a result, the normal operation of environment improvement facilities and the implementation of environmental protection measures are guaranteed making the environmental protection and management work go normally and effectively and thus well protecting the environment.

The purpose for water and soil conservation monitoring is to help the Owner implement the water and soil conservation scheme, strengthen the water and soil conservation design and construction management, optimize the water and soil loss control measures and coordinate the construction progress of the water and soil conservation works and main works; timely and accurately master the water and soil loss situation during the project construction and production period and the control efficiency so as to put forward improvement measures for water and soil loss and reduce water and soil loss caused by human factors; timely find major hazard risks of water and soil loss and give suggestions as to strategies for control of water and soil loss; provide basis for the water and soil conservation monitoring and management technologies as well as basic information of public supervision so as to promote the effective protection and timely restoration of the ecological environment of the project area.

12.8.2 Monitoring Plan

The impact of each component of the Project on the environment during construction is mainly reflected by the impact on the aquatic ecological system of river and water quality, the impact of noise and dust on environmental sensitive sites.

All the impact is relatively small in general and temporary during the construction period. With the approaching of construction deadline, such negative impact would disappear. Since the environmental impact of the four pipe network components is relatively small during the operation period, environmental protection monitoring plan is only needed to be prepared for the two heat & power cogeneration components. See Table 12-13 below for the specific monitoring points, items and frequencies. In addition, water and soil conservation monitoring plan needs to be determined for the thermal power plant component during the construction period. See Table 12-14 for the specific monitoring points, items and frequencies.

12.9 Social Action Plan

For preparation of the Social Action Plan included in this EIA, direct reference is made to the Social Assessment Report for Chongqing Small Town Integrated Water Environmental Improvement Project.

Based on full consultations with relevant departments and people in the project areas, Social Action Plan has been prepared to include concrete measures to ensure benefits of the Project to the people in the project areas and to minimize potential risks of the Project. The details of the Social Action Plan are shown in Table 12-15.

12.10 Cost Estimation for Environmental Protection

Total cost for environmental protection under the Project is 10.491 million yuan, the cost breakdowns for Rongchang, Tongnan, Pengshui and Shizhu project components are shown in Tables 12-16 through to 12-19.

Table 12-13 Environmental Monitoring Plan and the Cost Estimation

Period	Works	Monitoring Object	Monitoring Point	Monitoring Item	Monitoring Frequency	Total Expense (RMB 10,000)	Monitoring Unit	Responsible Organization	Supervision Organization	Standards and Norms Executed
Monitoring after completion for acceptance	Sewage collection and treatment works	Noise	Boundary of Rongchang sewage lift pump station	Equivalent continuous sound level A	Monitoring once; monitoring continuously for 2d; once in the daytime and once at night every day.	0.2	Qualified organization entrusted by the Owner in the form of a contract	The Owner	Environmental Protection Bureau of Rongchang County	Class 2 standard in the <i>Emission Standard for Industrial Enterprises Noise at Boundary</i> (GB12348-2008)
			Boundary of Shizhu sewage lift pump station		Monitoring once; monitoring continuously for 2d; once in the daytime and once at night every day.	0.2	Qualified organization entrusted by the Owner in the form of a contract	The Owner	Environmental Protection Bureau of Shizhu County	
Construction period	Flood control and sewage collection and treatment works	Noise	Rongchang upstream 1#, 3# and 5# temporary construction sites; downstream 2#, 3# and 5# temporary construction sites	Equivalent continuous sound level A	Monitoring once during peak construction hours; monitoring continuously for 2d; once in the daytime and once at night every day.	0.6	Qualified organization entrusted by the Owner in the form of a contract	The Owner of each component	Environmental Protection Bureau of Rongchang County	Class 2 standard in <i>Environmental Quality Standard for Noise</i> (GB3096-2008)
			Shizhu 2# and 4# temporary construction sites; Southwest Liren Hospital			0.3			Environmental Protection Bureau of Shizhu County	
			Pengshui 1# and 2# temporary construction sites; Xiatang Neighborhood			0.3			Environmental Protection Bureau of Pengshui County	

			Committee							
			Tongnan 1# temporary construction site; Tongnan Culture and Martial Art School;			0.2			Environmental Protection Bureau of Tongnan County	
	Ambient air	TSP	Rongchang upstream 1#, 3# and 5# temporary construction sites; downstream 2#, 3# and 5# temporary construction sites	Monitoring once during peak construction hours and monitoring continuously for 3d	Qualified organization entrusted by the Owner in the form of a contract	0.6	The Owner of each component	Environmental Protection Bureau of Rongchang County	Class II standard in <i>Integrated Emission Standard of Air Pollutants</i> (GB16297-1996) (new pollution)	
Shizhu 2# and 4# temporary construction sites; Southwest Liren Hospital			Environmental Protection Bureau of Shizhu County							
Pengshui 1# and 2# temporary construction sites; Xiatang Neighborhood Committee			Environmental Protection Bureau of Pengshui County							
Tongnan 1# temporary construction site; Tongnan Culture and Martial Art School;			Environmental Protection Bureau of Tongnan County							
	Surface water	SS	500m downstream of the dredging section of Shizhu County	Monitoring 1d during the peak hours of dredging; monitoring once respectively in the morning and afternoon; analyzing mixed samples	Qualified organization entrusted by the Owner in the form of a contract	0.2	The Owner	Environmental Protection Bureau of Shizhu County	Class III standard in <i>Surface Water Environmental Quality Standards</i> (GB3838-2002)	
			Water intake of					SS		Monitoring once (about

			Shangtang water plant of Pengshui County		30d) every day during the river-involved construction; monitoring once respectively in the morning and afternoon; analyzing mixed samples				Protection Bureau of Pengshui County	
			Xibutang spawning ground	SS	Monitoring once for 2d during peak hours of river-involved construction; monitoring once every day respectively in the morning and afternoon; analyzing mixed samples	0.2		The Owner	Environmental Protection Bureau of Tongnan County	
		Cultural relics	Giant Buddha Temple	Observation of cultural relics	Tracking and observing when approaching the construction at the cultural relics section	/	Tongnan Cultural Relics Department Entrusted	The Owner of each component	Environmental Protection Bureau of Tongnan County	Timely prevent the actions which may damage the cultural relics and suspend the construction timely if cultural relics are found damaged.
			Darong Bridge and Lukong Ancient Town			/	Rongchang Cultural Relics Department Entrusted		Environmental Protection Bureau of Rongchang County	
			Xujiaba Site	Supervision of cultural relics	Supervising and managing on site during the construction at the cultural relics section	/	Pengshui Cultural Relics Department Entrusted		Environmental Protection Bureau of Pengshui County	
Operation period	Sewage collection and treatment works	Noise	Boundary of Rongchang sewage lift pump station	Equivalent continuous sound level A	Monitoring once every year; monitoring continuously for 2d; once in the daytime and once at night every day.	0.2	Qualified organization entrusted by the Owner in the form of a contract	The Owner	Environmental Protection Bureau of Rongchang County	Class 2 standard in the <i>Emission Standard for Industrial Enterprises Noise at Boundary</i> (GB12348-2008)

			Boundary of Shizhu sewage lift pump station		Monitoring once every year; monitoring continuously for 2d; once in the daytime and once at night every day.	0.4	Qualified organization entrusted by the Owner in the form of a contract	Organization	Environmental Protection Bureau of Shizhu County	
--	--	--	---	--	--	-----	---	--------------	--	--

Table 12-14 Water and Soil Conservation Monitoring Plan and the Cost Estimation

Item	Monitoring Area	Monitoring Point	Monitoring Content	Monitoring Method	Monitoring Frequency	Expense (RMB 10,000)	Monitoring Unit	Responsible Organization	Supervision Organization
	Temporary construction site	Provide one ground monitoring point in the site; select a representative area in the green area to establish one vegetation monitoring point to monitor the growth and survival rate of vegetation.	(1) Monitoring of the main causes of water and soil loss They include rainfall, slope gradient, height and volume of waste bank, type of vegetation and degree of coverage, quantity and quality of water and soil conservation facilities, etc. Investigate the causes of water and soil loss and monitor the soil erosion background value of the original landscape.	The method of combining surface observation, investigation monitoring and site inspection monitoring;	Prior to construction, conduct for once an overall investigation on the soil loss volume and vegetation coverage rate of the original landscape; monitor and record the implementation of the water and soil conservation measures being implemented at least once every 10 days;	36.77	Qualified organization entrusted by the Owner in the form of a contract	The Owner	Local environmental protection bureau
	Access road area	Arrange one ground monitoring point at the middle section of the access road; and one plant monitoring point in the vegetation restoration area.	(2) Monitoring of the change in ecological environment with water and soil conservation measures in the project area. It includes the change in terrain and landform of the project area; the occupied and disturbed surface area in project construction; quantity and area of cut and fill; spoil volume and stacking area; and degree of coverage of forest and grassland.		Monitor and record the blocking effects of engineering measures for water and soil conservation at least once every month; monitor and record at least once every three months the construction progress of main works, influence factors of water and soil loss and the growth of				
	Sewage collection and	Arrange one ground monitoring point at the middle section							

	<p>treatment works</p>	<p>of the sewage pipe network of each component, ending with two monitoring points in total (i.e. one for Rongchang and one for Shizhu.)</p>	<p>(3) Dynamic monitoring of water and soil loss of the project area; The dynamic monitoring of water and soil loss of the project area involves monitoring of the change in area, degree and total quantity of water and soil loss and the harm caused to the surrounding area and harm trend.</p>					
<p>Dump area</p>		<p>Arrange one monitoring point at each dump area provided.</p>	<p>① Dynamic monitoring of the extent of responsibility for control of water and soil loss During the construction, the extent of responsibilities for control changes with the continuous change of working face. Therefore, dynamic monitoring of the extent of responsibilities for control of water and soil loss is a primary task. ② Monitoring of disturbed area; Record the disturbed area and situation of water and soil loss according to the working faces of excavation and backfilling, stacking area, construction road, construction camp, etc. ③ Dynamic monitoring of soil loss (erosion modulus); It mainly refers to real-time monitoring of the volume of soil loss in different disturbed areas and temporary waste yards by stages, so as to analyse and calculate the change in the volume of water and soil loss, master its change rule and lay a foundation for control water and soil loss. ④ Monitoring of the harm of water and soil loss;</p>	<p>vegetation after implementation of plant measures for water and soil loss; timely monitor the situations in case of rainstorm and gale; and finish monitoring within one week after the water and soil loss disaster event occurs. For the investigated and monitored items, investigation should be conducted once before, during the intermediate stage of and after the construction.</p>				

		<p>It mainly focuses on monitoring of the construction area by recording the degree of harm of water and soil loss caused to the surrounding area.</p> <p>(4) Monitoring of the effect of water and soil conservation measures;</p> <p>It refers to monitoring of the effects of various control measures, control over water and soil loss and improvement of ecological environment including monitoring of the effects of engineering measures for water and soil conservation and vegetation measure.</p> <p>① Monitoring of the control effect of engineering measures</p> <p>It mainly includes implemented quantity and implementation quality; stability, completeness and operation of protective works; and the spoil blocking effect of the measures.</p> <p>② Monitoring of the control effect of plant measures</p> <p>It mainly includes the area, survival rate, conservation rate, growth and degree of coverage of planted forest and grassland; restoration of disturbed surface forest and grassland; and the spoil blocking and soil conservation effects of plant measures.</p> <p>③ Monitoring of the control effect of temporary measures</p> <p>It mainly refers to monitoring of the quantity and quality of temporary protection measures and the spoil blocking and soil conservation effects of temporary blocking measures.</p>						
--	--	--	--	--	--	--	--	--

Table 12-15 Social Action Plan

Activities	Objectives or Targets	Responsible Organization	Cost	Timing
Project Management				
1. Chongqing Municipal Project Management Office (Chongqing PMO) and county/district project implementing organizations assign specific staff to take responsibility for implementing activities stipulated in the Social Action Plan.	(1) Assign specific staff to take responsibility to accomplish objectives defined in the Social Action Plan, RAP and Ethnic Minority Development Plan (EMDP) (if necessary)	Chongqing PMO County/district project implementing organizations	Without extra cost to the project	Prior to project implementation
2. Consultant team for project implementation support needs to include at least one social specialist	(1) Number of man.months allocated to social specialist in the contract with the consultant team; (2) Times of field visits assigned to social specialist as per the contract with the consultant team.	Consultant team for project implementation support	Cost budgeted in project for the consultant team	When the consultant team is entrusted
2. Contractor should ensure: - To observe all relevant regulations on labour by national and provincial governments and all relevant supplementary requirements in the project commitment document; - To employ as many as possible local villagers in project affected areas to work as unskillful workers, and try to meet as much as possible employment requirements of families of the vulnerable groups.	(1) Contractor should observe all regulations and requirements in project commitment document; (2) Contractor should consider as much as possible poor families in employing local labours; (3) Construction at project sites should not cause adverse environmental impacts on surrounding villages.	(1) Contractor, human resources and social security department and project owner; (2) Project owner, humanresources and social security department, poverty alleviation office, and women's federation jointly ensure implementation of relevant activities and help the contractor to employ local workers, if necessary	Cost assumed by contractor	Project implementation period
Project Implementation				
4. In process of land acquisition and resettlement: (1) Conduct in-depth socio-economic surveys prior to project implementation to understand details including amounts of land acquisition and resettlement, affected population and etc., and publicize the information, with full participation of affected	(1) Times of meetings organized and numbers of participants; (2) Approaches used for policy publicity; (3) Performance in incorporating	Project owner Land resources department Town/township and village heads Affected villagers	Responsible by project owner	Prior to commencement of project construction

Activities	Objectives or Targets	Responsible Organization	Cost	Timing
<p>villagers in the whole process;</p> <p>(2) Disclose and publicize policy on land acquisition and resettlement, explain to affected villagers if needed and respond to their questions;</p> <p>(3) Decide on issues regarding construction of resettlement arrangement houses, e.g. site selection, dates of construction commencement and completion, distribution scheme and etc.;</p> <p>(4) Fully consider needs of socio-economic development in the affected areas and of affected people, especially relevant requirements of ethnic minorities if the project is located in ethnic minority area. For instance, logo or signs with ethnic characteristics can be taken in construction design to cater to psychological features of ethnic people, such as color and pattern of guardrail, signs of key areas, landmark buildings, architectural design of resettlement arrangement residential buildings and etc.</p>	ethnic features in project design.			
<p>5. Formulate practical assistance policies on poverty alleviation, employment, skillfulness training to address needs of people affected by land acquisition and resettlement, based on local conditions in the project area.</p>	<p>(1) Guarantee income sources for project affected groups;</p> <p>(2) Embody poverty alleviation purpose of the project</p>	<p>Project owner Human resources and social security bureau, agricultural committee, women's federation and etc.</p>	Responsible by project owner	Prior-to construction and during implementation
<p>6. Before project implementation, stationing of engineering facilities should be clearly defined, with ample consideration given to convenience of trips and safety of local residents. For instance, measures including establishment of separation facilities, signs of warning and prior information disclosure of construction arrangement and etc. can be adopted.</p>	(1) Ensure convenience of trips and safety of local residents in the project area	<p>Project owner Contractor</p>	Responsible by contractor and project owner	Prior-to construction and during implementation
<p>7. Establish complete non-structural measures for flood control and protection:</p> <p>(1) Complete flood prediction systems in all project areas, mainly including 3 systems such as meteorological, hydrological and water conservancy systems; complete emergency response systems and establish emergency rescue systems that are under unified command and with features</p>	<p>(1) "Soft Measures" for flood control in the project areas;</p> <p>(2) Times of flood control rehearsals every year and the number of participants.</p>	<p>Project owner Water resources department</p>	<p>Project owner Water resources department</p>	During project implementation period

Activities	Objectives or Targets	Responsible Organization	Cost	Timing
<p>of reasonable structure, immediate reaction and efficient operation; establish completed flood control command system;</p> <p>(2) Conduct periodical flood early warning rehearsals, with flood control department taking the lead and cooperation of all relevant governmental departments, public institutions and the public, so as to help the residents to gain practical experience of flood control and protection;</p> <p>(3) Install some broadcasting facilities for flood message transfer, especially in areas with potential risk of flood accidents;</p> <p>(4) Constitute flood disaster insurance system to mitigate losses of affected people.</p>				
Project Information Dissemination				
<p>8. Prior to construction, information bulletins should be posted at conspicuous places of all construction sites/camps, with details of dates of commencement and completion of construction, name and phone number of representative of contractor for easier contact by local residents; meanwhile, contractor and project owner organize meetings to notify villagers and heads of communities of basic information of the project (including date of commencement of construction) and safety precautions and etc., so that the villagers can prepare ahead of the time for planting and harvesting arrangement.</p>	<p>(1) Performance in use of bulletins;</p> <p>(2) Numbers of meetings held and of participating villages/communities;</p> <p>(3) Record of participants, including details such as gender, age and name of village/community in which the participant reside.</p>	<p>Social specialist for project implementation support, project owner represented by county/district leader to organize meetings, town/township branch of human resources and social security bureau, heads of village /community, contractor.</p>	<p>Cost incurred is mainly for travel allowances of meeting participants, but in small amount</p>	<p>Prior to construction commencement</p>
<p>9. Publicize information on unskilled employment opportunities ahead of time in public places most often visited by villagers/residents or by means of media</p>	<p>(1) All local people know about employment opportunities the project bring about;</p> <p>(2) Contractor employs as many as possible local laborers for unskilled jobs available in the construction.</p>	<p>Contractor</p>	<p>Cost assumed by contractor</p>	
<p>10. Conduct awareness raising activities on waterway protection and environmentally friendly solid waste disposal in schools and communities in the project areas;</p>	<p>(1) Number of villages /communities covered by the activities;</p> <p>(2) Number of participating schools;</p> <p>(3) Number of participating students</p>	<p>Social specialist from the consultant team for project implementation support, project owner, local women, Education Bureau,</p>	<p>Costs incurred include mainly cost of publicity material (paper material and town/township</p>	<p>During project implementation</p>

Activities	Objectives or Targets	Responsible Organization	Cost	Timing
		Environmental Protection Bureau and Water Resources Bureau.	broadcasting facilities) and travel allowances for staff	
11. Strengthen knowledge publicity on flood protection in daily life to local residents through work by grass-roots cadres, community service staff, and make use of school resources to raise flood protection awareness of children and teenagers.	(1) Number of villages /communities covered by the activities; (2) Number of participating schools; (3) Numbers of participating villagers and students	Social specialist from the consultant team for project implementation support, project owner, Water Resources Bureau, Education Bureau and etc.	3 times of activities every year in each project area, costing about 10 thousand yuan each time	During Project implementation
Capacity Building for Project Implementation				
12. Establish supervision mechanism, including supervisors, guards, community environmental management teams, to ensure environmentally friendly disposal of solid waste and proper protection of waterways.		Environmental Protection Bureaus, Village Committees/Community Committees	Costs incurred are mainly for staff engaged and estimated at 1000 yuan/person	During Project implementation
13. Organize workshop engaging all project contractors /implementing organizations explaining contents and requirements in Social Action Plan and reasons for the activities to be conducted, and conduct relevant capacity building activities for implementation of the actions	(1) Record of the workshop attendance, including details of gender, age, title, job description of each attendee, and name of organization the attendee belonging to.	Social specialist from the consultant team for project implementation support	Without extra cost to the Project	Early stage of project implementation
Monitoring and Evaluation (M&E)				
14. Ensure effective monitoring and evaluation of social indicators 15. Collect data on participation of project stakeholders in training, meetings and other social activities, and include details of gender, age, income and occupation; 16. Ensure reliability of data collected for baseline and ICR; 17. Social specialist from the consultant team for project implementation support and/or staff of project implementing organizations should conduct regular visits to project sites, so as to review implementation status of actions included in Social Action Plan.	(1) Establishment of project performance monitoring system and monitoring framework; (2) Gender data collected in surveys for baseline and ICR; (3) Field surveys and regular management.	(1) Responsible staff of Chongqing PMO and implementing organizations to: a) assist communities in coordinating internal and external monitoring work; b) Project owner keep records of attendees to all meetings/trainings/notification meetings; c) Periodically gather and	- Costs of responsible staff of Chongqing PMO /Implementing organizations should be covered by routine management budget; - Costs for external M&E are included in the overall project monitoring cost. However, the suggestion is to set	During Project implementation

Activities	Objectives or Targets	Responsible Organization	Cost	Timing
		keep in archive duplicate copies of documents relating to activities mentioned above, for use in monitoring and evaluation.	aside a proportion specially for monitoring of Social Action Plan and socio-economic indicators.	

Table 12-16 Cost Estimation for Environmental Protection Measures (Rongchang Project Component)

Period	Name of Works	Control Item	Control Measures	Investment (RMB 10,000)	
Construction period	Flood control and sewage collection and treatment works	Control of dust	Enclosure of not less than 1.8m in height should be provided around the construction site; for hardening of ground, cleaning of vehicles going in and out of the site, dust baffle should be provided; bulk material should be covered with tarpaulin, dedicated stacking area should be provided and water should be sprayed on the site to prevent dust.	11	
		Treatment of waste water	Temporary separation tanks and sedimentation tanks should be provided for each construction site; waste water should be recycled after treated and waste water from foundation pit should be recycled after sedimentated.	40	
		Control of noise	Submersible sewage pumps with low noise are preferred to be selected and sound insulation pump house and measures for vibration reduction should be provided.	13	
		Ecological protection and water and soil conservation	Expense for engineering measures for water and soil conservation, expense for plant measures, expense for temporary engineering measures, independent expense, basic reserve funds and compensation fee for water and soil conservation	320	
		Monitoring after completion for acceptance			0.2
		Monitoring during construction period			1.8
Operation period	Sewage collection and treatment works	Noise	Inspection, equipment maintenance and enclosure	0.2	
		Expense for environment monitoring during operation period	Noise monitoring during operation period	0.2	
Total investment				386.4	

Table 12-17 Cost Estimation for Environmental Protection Measures (Tongnan Project Component)

Period	Name of Works	Control Item	Control Measures	Investment (RMB 10,000)
Construction period	Flood control and sewage collection and treatment works	Control of dust	Enclosure of not less than 1.8m in height should be provided around the construction site; for hardening of ground, cleaning of vehicles going in and out of the site, dust baffle should be provided; bulk material should be covered with tarpaulin, dedicated stacking area should be provided and water should be sprayed on the site to prevent dust.	8
		Treatment of waste water	Temporary separation tanks and sedimentation tanks should be provided for each construction site; waste water should be recycled after treated and waste water from foundation pit should be recycled after sedimentated.	35
		Control of noise	Submersible sewage pumps with low noise are preferred to be selected and sound insulation pump house and measures for vibration reduction should be provided.	10
		Ecological protection and water and soil conservation	Expense for engineering measures for water and soil conservation, expense for plant measures, expense for temporary engineering measures, independent expense, basic reserve funds and compensation fee for water and soil conservation	200
		Monitoring during construction period		
Total investment			253.8	

Table 12-18 Cost Estimation for Environmental Protection Measures (Pengshui Project Component)

Period	Name of Works	Control Item	Control Measures	Investment (RMB 10,000)
Construction period	Flood control and sewage collection and treatment works	Control of dust	Enclosure of not less than 1.8m in height should be provided around the construction site; for hardening of ground, cleaning of vehicles going in and out of the site, dust baffle should be provided; bulk material should be covered with tarpaulin, dedicated stacking area should be provided and water should be sprayed on the site to prevent dust.	5
		Treatment of waste water	Temporary separation tanks and sedimentation tanks should be provided for each construction site; waste water should be recycled after treated and waste water from foundation pit should be recycled after sedimentated.	20
		Control of noise	Submersible sewage pumps with low noise are preferred to be selected and sound insulation pump house and measures for vibration reduction should be provided.	8
		Ecological protection	Expense for engineering measures for water and soil conservation, expense for plant measures,	150

	and water and soil conservation	expense for temporary engineering measures, independent expense, basic reserve funds and compensation fee for water and soil conservation	
	Monitoring during construction period		3.9
	Total investment		186.9

Table 12-19 Cost Estimation for Environmental Protection Measures (Shizhu Project Component)

Period	Name of Works	Control Item	Control Measures	Investment (RMB 10,000)	
Construction period	Flood control and sewage collection and treatment works	Control of dust	Enclosure of not less than 1.8m in height should be provided around the construction site; for hardening of ground, cleaning of vehicles going in and out of the site, dust baffle should be provided; bulk material should be covered with tarpaulin, dedicated stacking area should be provided and water should be sprayed on the site to prevent dust.	6	
		Treatment of waste water	Temporary separation tanks and sedimentation tanks should be provided for each construction site; waste water should be recycled after treated and waste water from foundation pit should be recycled after sedimentated.	25	
		Control of noise	Submersible sewage pumps with low noise are preferred to be selected and sound insulation pump house and measures for vibration reduction should be provided.	9	
		Ecological protection and water and soil conservation	Expense for engineering measures for water and soil conservation, expense for plant measures, expense for temporary engineering measures, independent expense, basic reserve funds and compensation fee for water and soil conservation	180	
		Monitoring after completion for acceptance			0.2
		Monitoring during construction period			1.1
Operation period	Sewage collection and treatment works	Noise	Inspection, equipment maintenance and enclosure	0.3	
		Expense for environment monitoring during operation period	Noise monitoring during operation period	0.4	
Total investment				222	

12.11 Environmental Reporting System

During implementation of the Project, the Contractor and monitoring unit and the project office should record the project progress, implementation of management plan and monitoring result of environmental quality, and report to relevant departments in time. It mainly includes the following three aspects:

① The monitoring unit and the Contractor should keep a detailed record of the implementation of EMP and report to the project office in time.

② The project progress report prepared by the project office, such as monthly report, quarterly report and annual report, must include the implementation of EMP. For example, the implementation progress and effects of EMP.

③ The report on the implementation of the environmental management plan should be submitted to the Chongqing Municipal Management Office for the World Bank's Capital Utilization before March 10 every year. This report should consist of two parts, i.e. summary report on the implementation of the environmental management plan and professional monitoring report (atmospheric monitoring report, water monitoring report, noise monitoring report and water and soil conservation monitoring report). ④

④ The annual report on EMP implementation must be prepared and submitted to the World Bank by the Chongqing Municipal Management Office for the World Bank's Capital Utilization before March 31 of the following year.

EMP implementation report may include the following contents:

- a Project progress, such as the construction progress of embankment and pipe network works;
- b Implementation of EMP;④
- c Implementation of training plan;④
- d Whether there is public complaint or not. In case of a complaint, its main content, solution and public satisfaction index should be record.
- e EMP implementation plan of the next year.

12.12 Public Complaint Mechanism

In order to ensure that the problems found during the preparation and implementation of the Project are solved timely and effectively to guarantee the

smooth proceeding of land acquisition and construction of the Project, transparent and effective complaint channel are provided for the environmental management of the Project for a long term apart from the existing complaint channel by submitting petition letters to each level of local government. Basic complaint channels are as follows:

Stage 1: If the residents are influenced in any aspect of the environmental management, they may complain to the Project office of Guoxin Energy Corporation for Shanxi gas utilization project and the project office should make a decision for handling the complaint within 2 weeks.

Stage 2: If the residents are still not satisfied with the decision made by Project office of Guoxin Energy Corporation for Shanxi gas utilization project, they can, after receiving the decision, complain level by level to administrative organs with the right jurisdiction for arbitration according to *Administrative Procedure Law of the People's Republic of China*.

Stage 3: In case the residents are still not satisfied with the arbitration, they can, after receiving arbitration decision, file a lawsuit to civil court according to civil procedure law.

The residents may file a lawsuit regarding any aspect of the environmental management, including compensation standard, etc.

The above petition approaches would be notified to the residents through meeting or by other means, so as to make them fully understand the right of petition they have. Meanwhile, all kinds of media would be used to strengthen publicizing and reporting and comments and suggestions from every aspect for the environmental management work would be sorted out and presented in items of information to be investigated and handled by land acquisition management organization of each level.

The organization handling petitions of residents should not charge any fee and the expense related to petition should be paid as contingency allowance by the project office.

The petition feedback mechanism consists of standardized records, tracking and regular report systems.

Standardized record: The petition record mainly includes basic information of the petitioner, petition and replier, solution and effects achieved.

Tracking: Pay a return visit to the petitioner regarding whether the petition is handled or not and whether the petitioner is satisfied with the handling result.

Regular report: written report on the petition should be submitted regularly to the superior administration office and included in the plan of the next year to avoid occurrence of similar incidents.

13 Conclusions of This EIA

13.1 Compliance of the Project with Relevant Policies and Plans

The Project belongs to encouraged construction type “*river embankment construction and river course and reservoir improvement and management works*” as defined in Article 1, Section II “*water conservancy works*” of the *Catalogue for the Guidance of Industrial Restructuring* (2011 version), instead of the construction types to be limited and eliminated. Therefore, the construction of the Project is consistent with the *Catalogue for the Guidance of Industrial Restructuring* (2011 version).

As is stated in the “Outline of 12th Five Year Plan (2011-2015) for National Economic and Social Development in Chongqing”, Chongqing shall “accelerate development of small towns with focus placed on central towns of the cities/counties, complete functions of the small towns while properly increasing their size and population”. The 12th Five Year Plan of Chongqing Municipality for Ecological Construction and Environmental Protection” states that “Based on local and development features of the specific small towns, differentiated guidance shall be given to small towns to expedite their preparation and revision of environmental protection plans, so as to enhance environmental protection and ecological construction in the process of small town development. Comprehensive pollution control of secondary rivers should be promoted and integrated measures, including sewage interception and pollution control, river channel dredging and improvement, and ecological recovery and etc., should be taken to achieve the purpose of meeting water quality standards and recovering ecological functions of a river, based on local condition along the specific river section, as well as functions and pollution status of the river”.

The Project has been listed by NDRC and MOF as one of the World Bank loan pipeline projects for FY 2013-2015 as per the official document they jointly issued and entitled “ Notification by NDRC and MOF on Proposed World Bank Loan Pipeline Projects for FY 2013-2015” (Document FAGAIWAIZI No. (2012) 2208). On June 08, 2013, Chongqing Municipal DRC issued an approval document entitled “Notification on Inclusion of the Project Chongqing Small Town Integrated Water Environmental Improvement Project in the World Bank Loan Pipeline Projects for FY 2013-2015” (Document No.YuFaGaiWai (2013)932) for the proposed project.

The World Bank has supported several projects in Chongqing through providing funds for infrastructure development (roads, water supply, flood control, wastewater collection and treatment), vocational education, health care in the small towns and rural areas, all of which have contributed to comprehensive and coordinated reform for overall urban-rural development. The Project complies with relevant policies and requirements of the World Bank.

The Chongqing small town water environment treatment project is located in four counties of Chongqing and the project site selection meets the requirements stipulated in the local urban development plan, flood control and drainage plans. Implementation of the Project will help to improve the urban flood control grade,

reduce discharge of water pollutants, improve surface water environmental quality, and promote the development of small towns.

In conclusion, implementation of the Project complies with relevant national industrial policies and regulations, requirements in national economic and social development plan of Chongqing, policies of the World Bank for projects in China, as well as relevant local planning requirements of the project areas.

13.2 Evaluation of Current Environment Quality

13.2.1 Current Ambient Air Quality

According to the monitoring results, the ratio of maximum concentration and standard concentration for each pollutant in the ambient air of Rongchang component, Shizhu component and Tongnan component is smaller than 1, complying with the Class II standard requirements in *Ambient Air Quality Standards* (GB3095-2012) and presenting good ambient air quality. The concentration of NO₂ in the ambient air of Pengshui component has exceeded the standard concentration by 37.5% failing to comply with the Class II standard requirements in *Ambient Air Quality Standards* (GB3095-2012).

13.2.2 Current Water Environment Quality

According to the monitoring results, each monitoring index of Longhe River of Shizhu component and Fujiang River of Tongnan component meets the limit values for Class III water area in *Surface Water Environmental Quality Standards* (GB3838-2002), which indicates relatively good water quality and certain environmental capacity of the evaluation area of the Project; the Laixihe River of Rongchang component and Wujiang River of Pengshui component fail to meet the standard requirements for Class III water area in *Surface Water Environmental Quality Standards* (GB3838-2002), and the main reason lies in that domestic wastewater from households along the river banks is discharged into the river directly without collection.

13.2.3 Current Status of Noise Environment Quality

The environmental quality for noise of the locations of the four components is good and complies with Class 2 standard in *Environmental Quality Standard for Noise* (GB3096-2008).

13.3 Conclusions of Environmental Impact Assessment

13.3.1 Impact on Environment during Construction

The impact on social environment during project construction period is mainly reflected in jammed local traffic and inconvenience in getting around of residents. In addition, certain negative impact is also caused on local surface water, aquatic

ecological environment and cultural relics and historic sites during construction.

The impact on ecological environment mainly lies in impact of clearing borrowed and disposed soil, dredging sludge and floaters in river course. Since the original borrow pit and constructed dump area and landfill are used in the Project, small impact is caused on the environment.

The impact of construction noise is unavoidable and certain impact is caused on residents living within 50m of the embankment and sewage pipe network during the construction.

The impact on ambient air is mainly from dust caused by construction and offgas from construction machinery.

Since the Project is implemented around the towns and no construction camp is set up during the construction, the treatment of domestic wastewater relies on the existing facilities for surrounding farmer or urban residents.

The solid waste generated during construction mainly includes waste soil and slag, dredging sludge and floaters in river course. If there are no fixed disposal points and the waste is not cleared in time, mosquitoes and flies would breed and impact would be caused on the environment of the plant area and the living environment of surrounding residents.

The impact caused during construction is temporary and will disappear with the approaching of construction deadline.

13.3.2 Impacts on Environment during Operation

Implementation of the Project has remarkable positive impacts on social environment. The flood control works can improve the flood control level of towns and guarantee the safety of people's lives and properties; the sewage collection and treatment works can increase the collection and handling rate of sewage and improve the quality of surface water environment.

13.4 Measures for Mitigating Environmental Impact

13.4.1 Measures for Mitigating Negative Impacts during Construction

Pipe jacking will be adopted for constructions crossing highways of high grade; construction personnel should be managed strictly and the physical cultural resources management plan should be implemented strictly; ample preparation should be made prior to construction so as to ensure normal status of social life; specific management on construction near schools and kindergartens should be strengthened.

For construction noise, proper construction scheduling and layout is of greatest importance and thus should be conducted.

To reduce dust caused during construction, the construction site should be fenced; construction materials should be stacked reasonably and covered as required; water should be sprayed to prevent dust; and meanwhile management of vehicles which cause dust during transportation should be strengthened.

For the treatment of domestic wastewater from construction camp, residential houses should be rented nearby for the Project and no construction camp should be set up.

The waste soil and slag should be transported to designated legitimate disposal area for treatment. The dredging sludge from Shizhu component should be transported to Yaodianzi landfill for treatment. The floaters and domestic garbage from Rongchang component should be transported to Jiangjiagou landfill for treatment.

13.4.2 Measures for Mitigating Negative Impact during Operation

The impact caused during operation mainly refers to the impact of the operation of pump station on surrounding environment. The mitigation measures mainly include selection of submersible sewage pumps with low noise, provision of sound insulation pump house to realize insulation of sound from the pump and adoption of measures for vibration reduction. The pump station should be inspected every day and problems found should be solved in time.

13.5 Conclusion of Analysis on Environmental Benefits

(1) The project construction can effectively enhance the flood control level of the towns where the Project is located, and protect the lives and properties of the people there from being threatened by one-in-20-year flood.

(2) Implementation of the Project can help to collect the sewage discharged directly and transport to the sewage treatment plant for treatment before being discharged so as to promote improvement of local water environment. Since implementation of the Project can help to reduce the discharge of COD (8360.19t/a) and NH₃-N (608.01t/a) which account for 2.67% and 1.19% of the main pollutant discharge targets during the “Twelfth Five-Year” of Chongqing Municipality, it would make positive contributions to improvement of water environment quality in Chongqing.

(3) Implementation of the Project can provide more employment opportunities in the local areas, thus improve the income and living conditions of local people.

(4) The Project will benefit and promote coordinated development of local

environment, economy and society, alleviation of environment stress and creation of enabling environment for implementing sustainable development strategy in the local areas and establishing a well-off society in an all-round way.

Annex A: Environmental Management Framework for Pengshui Sewage Collection Component

1 Construction Activities Covered by This Environmental Management Framework

Flood protection and sewage collection component of Dianshui New District of Pengshui County includes construction of flood protection embankment, road on top of the embankment, wastewater treatment plant and the matching pipeline and etc. Since only construction activities for flood protection embankment and the road on top of the embankment have been defined for the time being, scale and location of the wastewater treatment plant and the matching pipeline are not yet decided due to lack of finished drainage plan of the county, this environmental management framework (hereinafter called as the Framework) is therefore prepared.

This Framework is for guidance to the project management institute and relevant departments for environmental management, so as to ensure environmental management under the Project fully consistent with relevant national and local policies, laws and regulations, as well as policies and procedures stipulated in OP/BP4.01 of the World Bank for environmental assessment of the relevant project component. This Framework defines the contents, steps and responsibilities for environmental management.

The specific project activity covered by this Framework is shown in Table 1 that follows.

Table 1 Project Activity Covered by this Framework

Project Activity	Description	Status
Wastewater Treatment Plant and the Matching Pipeline in Dianshui New District of Pengshui County	Construction of a Wastewater Treatment Plant and the Matching Pipeline	To be funded using World Bank Loan, still in process of planning and design, thus covered by this Framework

2 References Used in Preparing the Framework

2.1 Laws, Regulations on Environmental Protection and Sectoral Regulations

2.1.1 Law and Regulations

(1) *Environmental Protection Law of the People's Republic of China*, December 26, 1989

(2) *Environmental Impact Assessment Law of the People's Republic of China*, October 28, 2002

(3) *Law of the People's Republic of China on Atmospheric Pollution Prevention and*

Control (April 29, 2000);

(4) Law of the People's Republic of China on Prevention and Control of Ambient Noise Pollution (October 29, 1996);

(5) Law of the People's Republic of China on Water Pollution Prevention and Control (February 28, 2008);

(6) Law of the People's Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (December 29, 2004)

(7) Law of the People's Republic of China on Soil and Water Conservation (December 25, 2010);

(8) Law of the People's Republic of China on Protection of Cultural Relics (Amendment adopted and implemented from December 29, 2007);

(9) Land Management Law of the People's Republic of China (January 1998);

(10) Law of the People's Republic of China on Urban and Rural Planning (October 2007);

(11) Law of the People's Republic of China on Water Pollution Prevention and Control (February 28, 2008);

(12) Law of the People's Republic of China on Prevention and Control of Environmental Pollution Caused by Solid Waste (promulgated by Decree No.31 of the President of the People's Republic of China on December 29, 2004);

(13) Regulations on Environmental Protection of Construction Projects (State Council Decree No.253, issued on November 29, 1998);

(14) Decisions by the State Council on Implementing Scientific Development Perspective and Strengthening Environmental Protection (Document Guo Fa [2005] No.39, December 3, 2005);

(15) Interim Procedures for Public Consultation and Information Disclosure of Environmental Impact Assessment (Document Huan Fa [2006] No. 28 issued by the State Environmental Protection Administration, effective as of March 18, 2006);

(16) Guiding Catalogue for Industrial Restructuring (2011) (amended in 2013);

(17) Regulations of the People's Republic of China on Natural Reserves (State Council Decree No.167, promulgated on October 9, 1994);

(18) Guidance on Environmental Protection of Centralized Drinking Water Sources

(for Trial Implementation) (Document HuanBan No.(2012)50);

(19) Regulations of the People's Republic of China on River Channel Management (June 1988);

(20) Regulations of the People's Republic of China on Landscape and Scenic Spots;

(21) Notice on Strengthening Management on Environmental Impact Assessment to Prevent Environmental Risks (Document Huan Fa [2005] No. 152, December 16, 2005);

(22) Water Pollution Prevention and Control Plan for the Three Gorges Reservoir Area and the Upper Stream (Revised Version) (Document No. HuanFa (2008) 16);

(23) Regulations on Protection of Wetlands (Decree No.32 issued by the State Forestry Administration);

(24) Regulations of the People's Republic of China on Natural Reserves (State Council Decree No. 167, October 9, 1994);

(25) Enforcement Regulations on Protection of Terrestrial Wildlife (March 1992);

(26) Enforcement Regulations on Protection of Aquatic Wildlife (September 1993).

2.1.2 Local Regulations

(1) Regulations of Chongqing Municipality on Environmental Protection (Amended by the Standing Committee of the People's Congress of Chongqing Municipality in 2010);

(2) Procedures of Chongqing Municipality on Noise Pollution Prevention and Control (Decree of Chongqing Government No.(2013)270);

(3) Regulations of Chongqing Municipality on Water Pollution Prevention and Control for Changjiang Three Gorges Reservoir Area and the Catchment (effective as of October 1, 2011);

(4) Management Regulations of Chongqing Municipality on Water Conservancy Projects (amended in 2006);

(5) Regulations of Chongqing Municipality on River Channel Management (amended for the second time by the 18th meeting of the Standing Committee of the 3rd People's Congress of Chongqing Municipality on July 23, 2010);

(6) Provisions of Chongqing Municipality on Ambient Air Quality Function Zoning (Chongqing Municipal Government Document No.(2008) 135);

- (7) Ecological Function Zoning of Chongqing Municipality (Revised Version) (Chongqing Municipal Government Document No.(2008) 133);
- (8) Notification of Chongqing Municipality on Defining Key Control Zone for Water and Soil Erosion (Chongqing Municipal Government Document No.(1999) 8);
- (9) Notification of Chongqing Municipal Government on Approval and forwarding of the Adjustment Plan of Surface Water Environment Function Classification (Chongqing Municipal Government Document No.(2012) 4);
- (10) Notification of Chongqing Municipal Government on Printing and Distributing the Implementation Plan for the Five Actions for Environmental Protection of Chongqing (2013-2017) (Chongqing Municipal Government Document YuFuFa No.(2013) 43);
- (11) Notification of Chongqing Environmental Protection Bureau on Printing and Distributing the Adjustment Plan for Zoning Provisions for Applicable Ambient Noise Standards of Urban Area (Chongqing Environmental Protection Bureau Document YuHuanFa No. (2007) 39);
- (12) Notification of Chongqing Environmental Protection Bureau on Relevant Issues regarding the Adjustment Plan for Zoning Provisions for Applicable Ambient Noise Standards of Urban Area (Chongqing Environmental Protection Bureau Document YuHuanFa No. (2007) 78).

2.2 Technical Guidance for Environmental Impact Assessment

- (1) Technical Guidance for Environmental Impact Assessment-General Principles (HJ2.1-2011);
- (2) Technical Guidance for Environmental Impact Assessment-Ambient Air (HJ2.2-2008);
- (3) Technical Guidance for Environmental Impact Assessment-Surface Water Environment (HJ/T2.3-93);
- (4) Technical Guidance for Environmental Impact Assessment-Acoustic Environment (HJ2.4-2009);
- (5) Technical Guidance for Environmental Risk Assessment of Construction Projects (HJ/T169-2004);
- (6) Technical Guidance for Environmental Impact Assessment-Ecological Impact (HJ19-2011);
- (7) Tentative Procedures for Public Consultation of Environmental Impact Assessment

(Document No. HuanFa(2006)28 issued by the State Environmental Protection Administration on February 14, 2006);

(8) Technical Specification for Water and Soil Conservation Plan of Development and Construction Projects (GB50433-2008).

2.3 Safeguard Policies of the World Bank and EHS Guidelines

(1) Safeguard Policies of the World Bank

The project component is one of the 4 project components under the Chongqing Small Town Integrated Water Environmental Improvement Project. Given the sensitivity, scope and magnitude of environmental impacts of the Project, Category-A EIA, or full environmental assessment, is applicable. The project component mainly involves activities such as construction of wastewater treatment plant and the matching pipelines and etc. Through relevance analysis, safeguard policies triggered by the Project are OP4.01 (Environmental Assessment), OP 4.11 (Physical Cultural Resources), OP 4.12 (Involuntary Resettlement) and OP 4.04 (Natural Habitats).

At project preparation stage, the EIA institute collected aquatic ecological information and data on Binjiang section of Wujiang River in Pengshui County, and the data show that, although being seriously degraded and without important natural habitats, Wujiang River may have some spawning sites of ordinary fish, just that the specific locations of such spawning sites are not yet identified at that moment. At public consultation stage, relevant experts and departments indicated that, as long as proper measures taken in construction of the embankment, the potential spawning sites wouldn't be seriously impacted, but suspended solid (SS) in the discharge from the planned wastewater treatment plant may impact on the spawning sites. It was also noted that, the discharge outlet of the wastewater treatment plant should be located at least 500m downstream of the spawning sites. Therefore, high attention should be paid to this issue in the process of EIA preparation for the sewage collection and treatment construction activities under this component, and qualified institute should be engaged to conduct aquatic ecological investigations to the river section. Based on results of the investigation and requirements and procedures stipulated in OP4.04 of the World Bank, impacts on aquatic ecology should be assessed. Particularly, in deciding on location of the discharge outlet of the wastewater treatment plant, ample considerations should be given to recommendations by relevant experts and departments to avoid potential serious impacts on the spawning sites.

(2) EHS Guidelines of the World Bank Group

International Finance Corporation (IFC) Environment, Health and Safety Guidelines (EHS Guidelines), including guiding standards for atmospheric emission, ambient air quality, wastewater, water environment and noise, and EHS: Solid Waste Management.

3 Environment Management Procedures

The Environment Management Procedures cover five steps during project preparation and project construction, and two steps during project implementation. The requirements and responsibilities of each party at each step are as below:

A. Project Preparation and Construction Periods

- (1) Selection and classification of constructions
- (2) Preparation of environment documents
- (3) Public consultations (soliciting the public's opinions and disclosing information)
- (4) Appeal mechanism
- (5) Review and approval

B. Implementation Period

- (6) Supervision
- (7) Reporting
- (8) Requirements for project progress for each construction work

3.1 Classification of Constructions

This project component consists of two construction activities, both are new construction activities:

- (1) Construction of Dianshui New District Wastewater Treatment Plant;
- (2) Sewage Collection Pipeline for Dianshui New District Wastewater Treatment Plant.

3.2 Preparation of and Requirements for Environment Documents

The borrower should provide environment documents listed in the following table and the approvals obtained from relevant government agencies.

Table 3. Environment documents.

Type of Construction	Requirements for environment documents *
----------------------	--

Type 1. Construction of new facilities	<ul style="list-style-type: none"> ✓ Environment Impact Assessment (EIA) report and Environmental Management Plan; ✓ The EIA Report should be approved by the relevant local environment protection bureau.
--	---

The EIA Report

The borrower is responsible for the preparation of the EIA Report. The borrower should commit the environment impact assessment agencies that are approved by the relevant environment protection authorities and with relevant qualifications to assess the environment impacts and compile the EIA Report.

Environment Management Plan (EMP)

The borrower is responsible for the development of the EMP. The EMP should include the environment protection measures to be taken during project design, construction and implementation. These measures should try to eliminate or compensate the negative social and environmental impacts of the projects, or reduce such negative impacts to the minimum level or an acceptable level.

3.3 Public Consultations and Information Disclosure

The borrower should organize public consultations in accordance with the requirements of the government and the Bank. Its main responsibilities include: (1) to release environment documents; (2) to solicit opinions; and (3) to report major findings, conclusions, suggestions and feedbacks. The borrower or the environment impact assessment agency that it has committed should release the information in public places, disclose the environment documents and solicit the opinions of the residents nearby. The solicitation can be undertaken by means of survey questionnaires, workshops or hearings. The objectives of solicitations are to collect the opinions of residents who may be affected by project constructions and to identify the major environment issues that the affected residents deem important. All the important opinions raised during the solicitations will be included in the EIA report.

The environment management authority or the consultants it hires will be responsible for reviewing the records of the solicitations, determining whether or not feedbacks should be made to respond to the opinions and suggestions made by the public, and giving full attention to them when compiling the EIA report.

The requirements for public consultations for each construction are as follows:

Table 4. Requirements for public consultation

Type of construction	Relevant requirements
Construction 1: Construction of Dianshui New District Wastewater Treatment Plant	Organizing two rounds of public consultations: the 1 st round should take place prior to the completion of the EIA outline; the 2 nd round should take place after the completion of the EIA draft.
Construction 2: Sewage collection pipeline for Dianshui New District Wastewater Treatment Plant	Public consultations should be organized together with those for the above mentioned newly built wastewater treatment plant.

It is necessary to develop the information disclosure and public consultation procedures and methods in compliance with the relevant government's and the Bank's requirements. After the first round of public consultation and information disclosure, and before the environment selection and the preparation of the draft environment documents, the project information, major environmental impacts and mitigation measures should be made public in affected areas, and the opinions and suggestions of the public on the environmental impacts of the project should be solicited through public meetings, and feedbacks should be made. The second round of public consultation and information disclosure should be undertaken after the completion of the environment documents. The complete EIA report should be released in the affected areas. Comments and suggestions made by the public should be collected by organizing public meetings, and feedbacks should be made.

3.4 Grievance Appeal Mechanism

In order to continuously collect the public's opinions, disclose information and ensure the participation of communities during project implementation, the borrower should build an appeal mechanism.

The appeal mechanism should be included in the EIA report to ensure that all the complaints made by the affected groups or individuals are handled in a timely manner. During public consultations, the borrower should inform the affected groups or individuals of the appeal mechanism. The appealing mechanism should include: (1) recording and reporting system, including verbal and written complaints; (2) the person(s) handling complaints; and (3) the timeline and procedures for complaint handling. The complaining procedures include: the groups or individuals who are negatively affected by project constructions can file a complaint verbally or in writing to the borrower directly. Within a given time period upon the receipt of the complaint, the borrower should make a response to the complaint. The complainant who is not satisfied with the response can appeal to the local environment protection authority. In the case that the complainant still feels unsatisfied with the response by the local environment protection authority, he/she can bring the case to court.

3.5 Review and Approval

Domestic review and approval: The borrower is responsible for obtaining the approval for environment documents from the government. At the same time, the borrower should ensure that relevant policies, guidance and procedures of the Bank have been taken into full consideration during the preparation of the environment documents.

Review and approval by the Bank: The Bank will review the environment documents to ensure that the contents of such documents are in line with the requirements of the government and the Bank.

During project implementation: The borrower is responsible for the comprehensive and effective implementation of the EMP. It should also invite the external environment monitoring agencies to monitor the environmental impacts in line with the EMP and submit the EMP implementation progress report.

3.6 Supervision

During project implementation, the Bank, together with local environment protection authorities and the borrower, will supervise the project implementation to ensure the EMP has been implemented as required.

3.7 Reporting

During project implementation, the borrower should request project construction supervisors to report on the implementation of the EMP. Project construction supervisors should, in accordance with the monitoring plan in the EMP, carefully record the monitoring results and identify the corrective or preventive measures that are necessary to be taken during the monitoring. The progress reports submitted by the supervisors should include the implementation situation/progress of the EMP (e.g., the mitigation measures and supervision), the existence of major environment issues and the solutions. The borrower should submit semi-annual environmental management implementation reports to the Bank. Such reports should include: (1) the implementation situation of the EMP; (2) the environment issues emerged; and (3) the way in which the environment issues are handled and the results.

4 Identification of Environmental Impacts

4.1 Contents of Identification of Environmental Impacts

(1) Identification of Environmental Impacts of Wastewater Treatment Plant

Results of identified environmental impacts of construction of the wastewater treatment plant during the construction and operation periods are summarized in Table 5.

Table 5 Environmental Impacts of Construction of Wastewater Treatment Plant

Phase	Activities affecting the environment	Air	Surface water	Ground water	Noise	Soil	Soil erosion	Vegetation	Animal	Landscape	Environment risks
Construction period	Land demolition and resettlement					✓	✓	✓	✓	✓	
	Earth works	✓		✓	✓	✓	✓	✓	✓	✓	
	Roadbed and surface	✓			✓	✓	✓	✓	✓	✓	
	Transportation of materials	✓			✓						
	Construction of draining system		✓				✓				
	Activities of construction workers and vehicles					✓					
Operation period	Operation of the wastewater treatment plant	✓	✓	✓	✓						✓

During the operation phase, the most important environmental issue is how to manage the sludge appropriately.

(2) Identification of Environmental Impacts of Sewage Collection Pipeline

The following table gives results of identified environmental impact of sewage collection pipeline during construction and operation periods.

Table 6 Environmental Impacts of Construction of Sewage Collection Pipeline

Phase	Activities affecting the environment	Air	Surface water	Ground water	Noise	Soil	Soil erosion	Vegetation	Animal	Landscapes	Environment risks
Construction period	Temporary and permanent land occupation					✓	✓	✓	✓	✓	
	Earth works	✓		✓	✓	✓	✓	✓	✓	✓	
	Activities of construction workers and vehicles				✓					✓	
	Operation of the sewage system (wastewater)				✓						✓

4.2 Identification of Major Environmental Issues

(1) Identification of Environmentally Sensitive Areas

According to the confirmation by the Agricultural Committee of Panshui County, in the river sections within the construction areas, there are no national rare and endangered fish species, protected fish species listed by Chongqing municipal government and migratory fish species; there are no natural spawning grounds, feeding grounds, wintering grounds, migratory corridors of important aquatic organisms, or fish farms of certain scale. However, there may be spawning sites of ordinary fish in the river sections.

(2) Environmentally Sensitive Objects for Protection

After the construction contents and routes have been determined, detailed investigations will be conducted on the spot. As soon as an environmentally sensitive objects are identified, the EIA class will be rated in accordance with relevant requirements of the nation, and the specific mitigation measures shall be worked out.

4.3 Selection of EIA Tools

It is necessary to determine the EIA tools for each construction included in the framework as stipulated in Table 7.

Table 7 Selection of the EIA Tools

Item	Name of the construction	Nature	EIA tools	Remarks
1	Dianshui New District Wastewater Treatment Plant	Construction of new facility	EIA is necessary to deliver the EMP	Approval from the environment protection authority should be obtained
2	Sewage Collection Pipeling to Match with Dianshui New District Wastewater Treatment Plant	Construction of new facility	EIA is necessary to deliver the EMP	Approval from the environment protection authority should be obtained

4.4 Selection of Site and Route

4.4.1 Requirements of Site Selection of the Wastewater Treatment Plant

1. the site should be at the downstream of the headwater of the city, and a certain sanitation protective distance between it and the nearby residential areas should be kept.
2. the plant should be located in the direction from which the environmental impacts on nearby residential areas during summers are the lowest.
3. the engineering geologic conditions -- including soil, soil bearing capacity and the level of groundwater – should be favorable for the design, construction, management and cost saving.
4. the occupation/use of farmland should be avoided or reduced to the minimum level so that the construction of the wastewater treatment plant can be started relatively easily.
5. when selecting the site for the wastewater treatment plant, the short- and long-term development of the city should be taken into account; the future expansion of the plant should be considered, taking into account the master planning for rural and urban development.
6. The site should not be in flood-prone low-lying areas. If the location may be flooded as it is close to a waterbody, flood control measures should be taken.
7. The transportation conditions and the supply of water and power should be favorable to shorten the construction period and make the daily management of the wastewater treatment plant more convenient.
8. The slope, geographic and drainage conditions should be favorable to meet the

requirements of the vertical layout (or elevation arrangement) of the wastewater treatment facility and reduce the investment in the infrastructure and the cost of power.

4.4.2 Requirements of Route Selection for the Sewage Collection Pipeline

(1) The layout of the pipelines should reflect the geographic patterns, slope drainage should be employed, the route should be as short as possible, and circuitous routes and crossing with waterways, mountains and hills or other municipality utility systems should be avoided.

(2) It is necessary to make full use of the differences in elevation to avoid the construction of lift pump stations or reduce the number of such stations to the lowest possible level.

(3) Measures should be taken to avoid the impacts on the sensitive areas.

(4) When selecting the route, hydrogeology and engineering geology investigations should be conducted, and the routes associated with favorable hydrogeologic conditions should be selected. The burial depth of the pipelines should be as shallow as possible.

(5) The trunk sewers should be installed in the areas where the amount of wastewater is large and concentrated.

4.4.3 Requirement for Location of Discharge Outlet

In addition to relevant national regulations, the discharge outlet should be located at least 500m downstream of fish spawning sites.

5 Environment Management Procedures and Responsible Institutions

Table 8 Environmental Management Institutions and Their Responsibilities

Environment Management Institutions	Responsibilities
Chongqing PMO	<p>➤ <u>Project preparation:</u> (i) to determine the types of construction works and the requirements for environment documents, with the assistance of the consultants or consulting companies; (ii) to review the environment documents submitted by Hongyu Water Investment Construction Co. Ltd., Pengshui County (referred to as Hongyu Water hereinafter); (iii) to review Hongyu Water's capacity of effectively implementing the EMP; (iv) to ensure the contracts with provisions stipulating the enterprise's responsibilities of implementing the EMP; and (v) to request Hongyu Water to prepare and submit the environment due diligence report.</p>

	<ul style="list-style-type: none"> ➤ <u>During the implementation of construction works:</u> (i) to supervise the implementation of the EMP by Hongyu Water, with the assistance of experts and local environment protection bureaus; and (2) to regularly update the implementation situation of the EMP to the Bank.
Hongyu Water	<ul style="list-style-type: none"> ➤ <u>During project preparation:</u> (1) to be responsible for the planning, design and implementation of each construction work, and the preparation of environment documents (e.g., the EIA report, EMP and environment due diligence report) as required, and ensuring the participation of the public (public consultations and information disclosure). ➤ <u>During the implementation of construction works:</u> (i) to carry out project activities and to assist project review and supervision, in line with the approved environment documents; (ii) to ensure the requirements of the EMP are included in the bidding documents and relevant contracts; (iii) to record monitoring results in line with the monitoring plan included in the EMP, and at the same time, to identify the corrective or preventive measures necessary during monitoring, as well as the results of similar activities that have been carried out during the previous reporting period; and (iv) to submit the progress report to the project management unit, in which the implementation situation of the EMP should be included.
EIA agency or consultants or experts	<ul style="list-style-type: none"> ➤ To prepare the EIA report and the EMP, committed by Hongyu Water; ➤ to assist Hongyu Water to implement the EMP.
Local environment protection authorities	<ul style="list-style-type: none"> ➤ <u>During project preparation:</u> to review and approve the EIA report; ➤ <u>During the implementation of construction works:</u> (i) to supervise the implementation of the EMP; (ii) to ensure that the enterprise complies with 'three simultaneity' system and relevant environment policies; and (iii) to carry out other daily operations, such as coordinating and handling pollution events and disputes.
The Bank	<ul style="list-style-type: none"> ➤ To review the environment documents and to supervise the implementation of the EMP.

6 Environmental Management Procedures

For the construction works that are included in the environmental management framework (EMF), a set of environment management procedures has been developed for the effective environment management of the general impacts emerged during construction. It stipulates the environment management measures, institutions, environment supervision procedures and requirements. As to the sensitive spots identified during the further environmental impact analysis by employing the selected EIA tools and the development of mitigation measures, the detailed impact analysis should be carried out and the specific measures should be developed.

The details of the EMF are described in the following table (Table 9).

Table 9 Environmental Management Procedures

Construction work	Environmental impact mitigation measures	Implementation unit	Supervisory unit	Monitoring unit
During design Period				
Implementing environment measures when producing the engineering drawings and preparing the bids	<ol style="list-style-type: none"> 1. Each civil work contractor is requested to allocate 1-2 on-site environmental engineers who are responsible for the implementation of environment measures throughout the construction period, and ensuring the civil work activities and the construction activities by sub-contractors (if there are any) meet all the requirements stipulated in this protocol and the necessary environment measures are taken during the construction period. 2. During construction, the contractor should communicate and negotiate with the mass living or working in project areas, set up bulletins at each entrance to the construction site to inform the public of the detailed construction activities and the duration of the construction works. Meanwhile, it should provide the name(s) of contact person(s) and contact methods, so that the general public can file complaints or provide suggestions. 3. The contractor should proactively coordinate with the environment-supervising unit committed by the owner of the construction to carry out all supervisory activities during the construction period. 4. After signing on the contract and before starting construction works, the contractor should include the 'on-spot' EMP in its construction plan. 5. The contractor should comply with the requirements for safe and civilized construction in project areas. 6. Before starting to construct, the civil work contractors and supervisors should complete relevant environmental protection and management training. 7. In the event that severe environmental impacts emerge due to the incompliance with the environmental protection measures specified in this protocol, the environmental supervisor or the civil work contractor must take corrective measures immediately and inform the relevant PMO within 24 hours. The CPMO should supervise and assist the civil work contractor to take corrective measures. The contractor should record the implementation status of the corrective 	PMO	PMO, owner, relevant municipal (county) environment protection bureaus and traffic management bureau	

			measures and report to the supervisors and CPMOs. 8. In each year, the contractor should retain a certain percentage of the contract amount as the deposit for environment management, which should be about 3% of the budget.			
During construction						
Environmental protection implementation protocol when making preparation on the construction site			1. The scopes of temporary and permanent land occupation/use (construction and production areas, camps, construction paths, material yards) should be determined, and relevant land use procedures should be completed.	Construction unit	PMO, owner, city (county) environment protection bureaus and traffic management bureaus.	The owner should contract the qualified agencies to do so.
			2. Survey of the existing pipelines on the construction site should be carried out to avoid causing damages to them.			
			3. Construction areas, camps, construction paths, borrow pits and waste pits should be kept far away from surface water.			
			4. The construction unit should negotiate with the City or County PMO to determine the appropriate public source of water, and use the running water provided by the city as the source of drinkable water. It is strictly prohibited to dig new wells.			
Construction field management	Controlling environmental impacts on construction areas where the major facility is constructed	Cleaning — up the surface	1. Attention should be paid to water spray and dust suppression.			
			2. Construction wastes should be removed in a timely manner; only vehicles with a closed container can be used to transport earth and wastes.			
		Constructing road bed	1. Crossing roadbed and pipeline should be under strict control; damage to the surrounding vegetation cover due to over-digging should be avoided as much as possible, and trees outside of the construction sites should not be cut down arbitrarily.			
			2. Construction wastes should be removed in a timely manner; only vehicles with a closed container can be used to transport earth and wastes.			
			3. Water should be sprayed on the construction site to reduce dust.			
		Ecological restoration	1. Before the completion of the construction work, the affected land should be restored to at least what it is before the construction work is started.			
			2. During the construction period, the tillable surface soil that has been peeled should be stored temporarily in a relatively flat area on the site, with bags of earth as barriers and draining			

			and desilting measures in place, covered by dust-proof nets; such soil should be used to restore the land used to build construction camps after the construction work is completed.			
		Construction noise	<ol style="list-style-type: none"> 1. The construction time should be controlled strictly. If the distance between the construction site and the residential area is less than 200m, the equipments/machinery that may generate loud noise should be stopped at night (22:00-06:00). If it is necessary to continue the construction at night, depending on the situation, the construction unit should contact with the local environment protection bureau in a timely manner, and apply for the permit for construction at night, and inform the public in order to get support from the public as much as possible. 2. With respect to the sensitive spot close to the construction site (within 50m), it is necessary to take measures (such as installing mobile or temporary acoustic barriers) to reduce noise. 3. The construction site should be kept away from schools as far as possible. It is necessary to negotiate with the school to determine the operation time of machinery and equipments that produce loud noise, and efforts should be made to avoid operating such machinery and equipments during the exam season. 			
		Others	<ol style="list-style-type: none"> 1. It is strictly prohibited to burn any kind of wastes on the construction site. 			
	Controlling environmental impacts in construction and production areas	Cleaning up the surface	<ol style="list-style-type: none"> 1. Attention should be paid to water spray and dust suppression. 2. Construction wastes should be removed in a timely manner and disposed appropriately. 			
<ol style="list-style-type: none"> 1. Ready-mix concrete should be the first choice. 2. Concrete should be mixed with water; during this process, the mixture should be placed in a closed container. 						
Uploading or unloading material		<ol style="list-style-type: none"> 1. When transporting, storing, uploading or downloading earth, concrete and lime, wind-proofing and dust-reducing measures should be taken. 2. Material yard should be located in 				

		s	<p>the flat and solid area on the site.</p> <p>3. Barriers should be set up around the material yard where concrete, lime and stones are stored, and such materials should be covered by plastic sheets to avoid or reduce the pollution due to rain-wash.</p>			
		Vehicles for construction purpose	<p>1. At the entrance /exit to the construction site, washing facilities should be installed to clean up the vehicles before they leave the site. The road connecting the washing facility and the entrance/exit should be hardened by concrete, asphalt or crushed bricks; the vehicles should not carry dust away from the construction site.</p> <p>2. Only vehicles with a closed container can be used to transport earth and wastes.</p>			
		Casting yard	<p>1. The wastewater generated when mixing concrete should not be discharged arbitrarily, and instead should be collected at the sedimentation tanks, and then sprayed to reduce dust after being treated. The sedimentation tank should be buried after the construction work is completed and ecological restoration should be undertaken.</p>			
		Noise	<p>1. For the immovable machinery that produce a large amount of vibration (e.g., mixer), vibration mount(s) should be installed.</p> <p>2. Acoustical barriers should be installed to reduce the sound pollution by machinery/equipments that generate loud noise; or such machinery/equipments should be placed and operated indoors.</p> <p>3. The construction time should be controlled strictly. If the distance between the construction site and the residential area is less than 200m, the equipments/machinery that may generate loud noise should be stopped at night (22:00-06:00).</p>			
		Others	<p>1. Before the completion of the construction work, the affected land should be restored to at least what it is before the construction work is started.</p> <p>2. During the construction period, the tillable surface soil that has been peeled should be stored temporarily in a relatively flat area on the sit, surrounded by bags of earth as barriers with draining and desilting measures in place, and covered by dust-proof nets; such soil should be used</p>			

			for restoring the land used for building construction camps after the construction work is completed.			
			3. It is strictly prohibited to burn any kind of wastes on the construction site.			
Management of construction facilities/equipments	Controlling oil pollution due to leakage	1.	Advanced equipments and machinery should be selected as much as possible to effectively reduce the occurrence of water leakage and the number of equipments and machinery repairs, and as a result reduce the amount of greasy wastewater.			
		2.	In the case that water leakage is unavoidable, solid oil-absorbing materials (e.g., cotton yam, wood chips and oil-absorbing sheets) should be used if possible. In this way, the grease can be absorbed and contained by solid, and the amount of greasy wastewater can be reduced.			
		3.	The maintenance for machinery, equipments and vehicles should be carried out mainly at the maintenance yard on each road section to make it easier to collect greasy wastewater.			
		4.	Horizontal flow sedimentation tanks should be installed in the maintenance yard to collect greasy wastewater; after some simple treatments such as acid-base neutralization, sedimentation, oil water separation, residual removal, etc., the water can be discharged. After the construction is completed, the sedimentation tanks should be buried and trees /bush/grass should be planted on top of them.			
		5.	The floor in the maintenance yard should be hardened and seepage treatment should be applied to the floor to avoid the soil being polluted by leaking oil.			
		6.	It is necessary to record equipment maintenance and repairs, and undertake regular maintenance according to the equipment operation status.			
	Controlling the noise produced by equipments	1.	The construction unit should use the equipments, machinery and vehicles that are in line with relevant national standards and try to choose the equipments and machinery that generate low noise.			
		2.	For the immovable machinery that produce a large amount of vibration (e.g., power-generating vehicles), vibration mounts should be installed, or such machinery should be placed and operated indoors.			
		3.	The maintenance and repair of each type of construction equipments should be strengthened to ensure the sound operation and to reduce noise and vibration fundamentally.			
	Air emission control	1.	The construction unit should use the equipments, machinery and vehicles that are in line with relevant national sanitation standards to ensure the air emission meets relevant national standards.			
Solid waste control	1.	The sporadically generated poisonous wastes (gloves contaminated by oil) should be collected and treated by qualified units committed by the project.				

		<p>2. The oil that leaks into soil should be removed by using scrapers, sealed, and then transported to the qualified treatment plant to dispose.</p> <p>3. In case it is impossible to maintain or repair the equipments, facility or vehicles at the maintenance yard at each road section, then containers or oil-absorbing solid should be used to absorb the generated greasy wastewater, which will then be collected, sealed and shipped away for treatment. The destination should be as close to the qualified treatment plant as possible.</p>			
Environment protection implementation protocol at construction camps	Flattening the site	1. Construction wastes should be removed in a timely manner; only vehicles with a closed container can be used to transport earth and wastes.			
		2. Water should be sprayed on the construction sites to reduce dust.			
	Controlling residential wastewater	1. Oil [water] separation tanks should be installed in canteens, and be cleaned by the designated cleaning units, which should have the permit for disposing of wastes and the permit for operation issued by relevant authorities.			
		2. On construction camps, temporary toilets should be installed, affiliated with septic tanks. Seepage treatment should be applied to the tanks.			
		3. On the camps, draining ditches and sedimentation tanks should be installed; filtering nets should be installed in the pipelines connecting to the canteen, washing room and shower room. After flowing through sedimentation tanks, construction wastewater can be discharged into the municipal draining system or rivers. At the same time, efforts should be made to ensure that the draining ditches are clean and function well.			
		4. On construction camps, draining should be kept smooth; no one should pee or poo all over the camps.			
		5. It is strictly prohibited to dump or discharge any kind of residential wastewater into draining pipelines; it is also prohibited to dump any residential or construction wastes near the camps.			
	Controlling residential air emission	1. Clean resources such as natural gas and electrical power should be used for cooking on camps in line with relevant regulations issued by local environment protection authorities.			
	Controlling solid wastes	1. Wastes that can be recycled (e.g., used paper) should be collected and treated by designated recyclers.			
		2. Closed trash tanks should be placed on construction camps, such that residential trash are collected, removed and disposed of according to relevant requirements and in a timely manner.			
3. Slop buckets should be put in place outside of the					

			canteens. The buckets should be cleaned and the slops should be removed in a timely manner.			
			4. Septic tanks should be cleaned by designated persons. After the construction is completed, such tanks should be buried.			
	Controlling ecological impacts		1. Within one month after the completion of the construction, all temporary buildings should be demolished and the land should be restored to what it is before the construction is started.			
			2. During the construction period, the tillable surface soil that has been peeled should be stored temporarily in a relatively flat area on the site, surrounded by bags of earth as barriers, with draining and desilting measures in place, covered by dust-proof nets; such soil should be used to restore the land used to build construction camps after the construction work is completed.			
	Other requirements		1. Clay bricks are prohibited to use when constructing temporary buildings on camps; such buildings should meet the safety and firefighting standards and other relevant national standards.			
			2. The camps and construction areas should be clearly separated. Relevant separation measures should be applied to ensure that the camps are clean, tidy and well organized.			
			3. It is prohibited to burn any kind of wastes on camps.			
Implementing environment protection protocol on material yards	Controlling environmental impacts in borrow pit	General requirements	1. Deep excavations should be avoided as much as possible. The volumes of the excavations and fills should be balanced as much as possible. If more earth is needed, purchasing commercial earth and earth abandoned by urban construction projects should be considered first. Establishing borrow pits should be avoided, to ultimately eliminate the environment impacts of the borrow pits.			
			2. Earth collection should be conducted in a centralized way to reduce the number of borrow pits.			
		Dust suppression	1. Attention should be paid to water spray and dust suppression, to reduce dust pollution as a result of excavations.			
		Controlling ecological impacts	1. During excavations, surface soil should be temporarily stored for land reclamation in a relatively flat area on the site, surrounded by bags of earth as barriers, with temporary drainage ditches and sedimentation measures in place, covered by dust-proof nets. After the construction is completed, surface soil should be used for ecological restoration at borrow pits.			

			2. Vegetation cover should be restored at the end of the construction.				
		Controlling landscape	1. Relevant environment protection measures should be carried out in line with the requirements in the EIA report.				
	Environmental impacts control at abandoned dreg pits	General Requirements	1. It is necessary to first consider reusing abandoned dreg (if there are any) on the site or shipping them to other construction sites for reutilization. Alternatively, they can be used for restoration at borrow pits. The establishment of a abandoned dreg pit should be avoided to fundamentally eliminate the environment impacts of borrow pits.				
2. In case abandoned dreg cannot be recycled, it is necessary to first understand if there are designated abandoned dreg treatment plant. If yes, the relevant procedures should be completed and the abandoned dreg should be shipped to the designated treatment plant.							
Dust control		3. Compaction in layers should be applied to the abandoned dreg pit to effectively reduce dust.					
		4. Water should be sprayed to reduce dust.					
Ecological impacts control		1. Before building abandoned dreg pits, surface soil should be peeled for land reclamation and temporarily stored in the relatively flat area on the site, surrounded by bags of earth as barriers, with temporary draining ditches and sedimentation tanks in place, covered by dust-proof nets. After the construction is completed, surface soil will be used for ecological restoration at abandoned dreg pits.					
	5. After the earth is collected, the land should be restored.						
Soil erosion prevention plan	The main construction area	1. Surface soil should not be stored at the places where surface runoffs converge, or roads close to the construction site or environmentally sensitive areas that are close to rivers; the area that may affect construction or the smooth traffic on the road. Instead, surface soil should be stored at the relatively low and idle area to reduce the volume of protective measures. For temporary storage, surface soil can be piled in the acquired land on the two sides of the roadbed. In order to avoid the soil sliding down, bags of earth should be used as barriers along soil piles. Such soil should be used for landscaping at the end of the construction.					

		<p>2. A grouted rock draining ditch should be built along the wall of the plant (outside), with sedimentation tanks on the two ends. Before flattening the land, surface soil should be peeled. At the end of the construction, it should be covered by soil for landscaping purpose.</p>			
		<p>3. For the earth stored temporarily, barriers should be built to prevent damage caused by rainfall splashing.</p>			
		<p>4. Sedimentation tanks should be built at the outlet of the roadbed.</p>			
	Construction and production area	<p>1. In the construction and production area, the protection focus should be put on soil erosion. As vehicles run back and forth frequently and for the needs of storing materials, the floor in the whole area should be hardened by concrete.</p>			
		<p>2. During wet seasons, barriers should be built up along the boundary of low-lying areas to prevent damage caused by rainfall splashing.</p>			
		<p>3. Surface soil and materials stored should be covered by dust-proof nets, barriers should be built to prevent damage caused by rainfall splashing.</p>			
		<p>4. The construction time should be arranged reasonably, and the length of temporary land use should be shortened. After the completion of the construction, vegetation restoration or reclamation should be carried out immediately.</p>			
	Construction paths	<p>1. Engineering protection and draining system should be employed along newly built construction paths.</p>			
		<p>2. The construction time should be arranged reasonably, and the length of temporary land use should be shortened. After the completion of the construction, vegetation restoration or reclamation should be carried out immediately.</p>			
	Construction camps	<p>1. Temporary afforestation should be applied to the outside of the sheds and the hardened areas. Grass and flower seeds and bushes should be planted to improve the landscape on the camps.</p>			
		<p>2. Brick draining ditches should be built to discharge the stagnant water.</p>			
		<p>3. At the end of the construction, sheds and hardened surface should be removed, the land should be flattened and the vegetation should be recovered.</p>			
	Borrow pits	<p>1. Before start to operate at borrow pits, the necessary water interception and draining measures should be taken: draining ditches should be built around the pit, sedimentation tanks should be built at the outlet, after sedimentation, rainwater can be discharged to nearby natural gullies; at the platform on the slope and the outside of the slope, water interception ditches should be built, connecting to draining ditches.</p>			
		<p>2. Efforts should be made such that after excavating</p>			

		<p>a small area, the land will be restored and trees and grass will be planted, to avoid the situation that a large area is excavated and exposed, causing serious soil erosion. Before afforestation, surface soil should be backfilled, and the land should be flattened.</p> <p>3. The slope where restoration of the vegetation cover takes a longer time should be covered in case of heavy rainfalls to avoid runoff scouring.</p> <p>4. After the construction is completed, afforestation or reclamation should be carried out immediately.</p>			
	Abandoned dreg pit	<p>1. In case of practicable difficulties, the abandoned dreg pits should be built. Such pits should stand in basins or low-lying areas.</p> <p>2. Before abandoning dregs, barriers should be built at the places lower than the pit, based on the land patterns; when building such barriers, the location where abandoned dregs will be placed and the land patterns should be fully considered, and such barriers should be safe, economic and reasonable.</p> <p>3. In the areas above the pit, intercepting dikes should be built to intercept runoffs. On the two ends, desilting tanks should be built. If the slopes of the dikes are relatively steep, energy dissipators should be put in place.</p> <p>4. After the abandoned dreg have been compacted and flattened, draining ditches should be built.</p> <p>5. After the construction is completed, ecological restoration should be conducted at the abandoned dreg pit.</p>			
Ecological restoration		<p>1. During ecological restoration, the peeled surface soil that has been stored during the preparation of the construction site should be used as much as possible to reduce the use of new soil.</p> <p>2. Trees, bushes and grasses should be planted. That is, when planting trees, it is necessary to also plant bushes that grow fast so that the whole area is covered by plants and the invasion of alien species can be prevented.</p> <p>3. Alien species should not be introduced.</p>			
Preservation of cultural relics		<p>1. Provided immovable cultural relics (e.g., ancient relics and ancient tombs) have been discovered, the construction must be stopped immediately. Under the supervision of the construction supervisors, the site must be preserved well and no one can dispose of it arbitrarily, and the cultural relics preservation authority should be notified immediately.</p> <p>2. After the cultural relics preservation authority evaluates and cleans the relics, the construction unit should develop a construction plan specifically for the area where the relics are discovered, and resume the construction after the cultural relics preservation authority approves the plan.</p> <p>3. Movable cultural relics (including stuffs used in</p>			

	daily lives or production in ancient times) that are discovered should be submitted to the cultural relics preservation authority proactively, no one shall keep them.			
Construction transportation management	1. The construction time should be arranged reasonably, and the length of temporary land use should be shortened.			
	2. Only vehicles with a closed container can be used to transport earth and wastes.			
	3. If the distance between contiguous residential areas and the construction path is less than 50m, then transporting construction materials on the path at night should be prohibited.			
	4. The operation of construction vehicles should avoid traffic peak hours to prevent traffic jams and the occurrence of accidents.			
	5. Vehicles should run on the designated routes. Changing routes without approval and doing harm to farmland and forestland are prohibited.			
Traffic safety	1. Drivers should pay attention to safe driving; they should drive along the designated routes, and not change lanes or routes arbitrarily.			
	2. Drivers should improve their driving skills, and they all should have a driver license.			
	3. A limit to the continuous driving time should be set; drivers can rotate. Drivers should avoid driving on dangerous road sections or during dangerous times to reduce the occurrence of traffic accidents. Vehicles and pedestrians should respect the traffic lights or the traffic policemen's instructions.			
	4. The speed control system should be installed on vehicles to monitor drivers' performance.			
	5. Spare parts should be purchased timely for vehicle maintenance to avoid severe accidents as a result of premature engine failures.			
	6. Pedestrians and vehicles should be separated as much as possible. Pedestrians should use the crosswalk, bridges, tunnels to cross the roads and they should respect the right of way of others.			
	7. The visibility of traffic signs should be improved to fully promote safe traffic.			
	8. Safe traffic and pedestrian safety campaigns should be delivered near schools and residential areas.			
	9. The provision of appropriate first aid rescue during the incidents should be ensured by coordinating with persons handling emergent situations. Materials should be purchased locally as much as possible to reduce transportation distance. Large vans should be used on the construction site to reduce traffic load. Traffic safety restriction measures should be taken to warn vehicles and pedestrians of dangerous traffic conditions by means of signs and lights. Temporary bridges should be built up at sensitive			

	sections, e.g., schools, hospitals, residential areas, senior nursery houses to ensure that pedestrians can cross roads safely.			
	10. It is better to purchase local materials to reduce transportation distance and use shuttle buses to transport workers to reduce the use of vehicles from the outside as much as possible.			
	11. Overloading should be avoided. Meanwhile, the load should be covered to prevent spilling. The transportation routes and times should be planned carefully to avoid affecting the traffic conditions in the central areas, key roads and residential areas. For the road sections where the requirements are very strict, transportation at night should be adopted taking into account the specific situations. The earth spilled should be cleaned and removed timely to reduce dust pollution.			
	12. At the excavating sections, lights should be installed and turned on at night.			
Dangerous wastes, and flammable and explosive products	1. When fuel and diesel are shipped to the construction site, inspectors should check the package, if leakage takes place, they should be refused and returned.			
	2. The designated warehouses for oil and chemicals should be built in the construction and production area, with warning signs. Anti-leaking treatment should be applied to the floor. Absorbing bags, sands and wood chips should be put in place.			
	3. An emergency plan should be developed; before entering the site, workers should be provided with training.			
Public participation	1. Bulletins should be set up at each entrance to the construction site to inform the public of the name, contents, and duration of the construction work, and the names of contact person(s) and contact methods for filing complaints or providing suggestions.			
	2. It is necessary to organize environment protection experts and technicians to answer the questions and concerns raised by the public.			
	3. If it is necessary to continue the construction at night, the construction unit should complete relevant procedures, and inform the nearby residents by making an announcement. The announcement should include: the starting and ending time of the continuous construction, and the permit for construction at night issued by the environment protection authority.			
	4. If the municipal utility service has to be interrupted due to the construction (including water, power, telephone and bus, etc.), it is necessary to post an announcement at the project site, affected neighborhoods and enterprises, illustrating the starting and ending time of the interruption.			
	5. All the comments and concerns raised by the			

	public should be recorded, archived and responded – the responses and feedbacks should be recorded and archived as well and subject to the supervision by the supervisory agencies.			
Controlling social and environmental impacts	1. Each kind of allowances or compensations for land demolition and resettlement should be in line with national and Chongqing municipal standards, and distributed to relevant villages/groups/individuals, taking into account local conditions and the agreements signed with the affected households; democracy and citizens' basic rights should be fully respected, such that the compensations are distributed and used appropriately; farmland should be adjusted appropriately, labor force should be allocated adequately, and relevant policies should be implemented.			
	2. The operation of construction vehicles during peak hours should be avoided as much as possible to prevent traffic jams and the occurrence of accidents.			
	3. During the construction of the proposed road, in case existing local roads have been occupied or damaged, removal and protective measures should be carried out after the construction is completed, the roads should be restored, trees should be planted, and a certain amount of compensation fee should be paid to local governments to protect the lawful interests of local governments and residents.			
Controlling impacts on landscape	(1) In order to make the landscape of the construction match the surrounding landscape, the slopes of excavations and backfills should reach the natural ground, arch-shaped slopes can be used to improve the view. The surface of the slope should be rough to some extent, so that protective measures can be taken or grasses can be planted.			
	(2) As most construction paths are along the two sides of roads, it is suggested to strengthen the environment protection promotion to raise environment awareness of the management and workers; throwing residential and production wastes all over is strictly forbidden.			
	(3) At the abandoned dreg pit and material yard, operation can be conducted within designated areas only. Throwing wastes all over is strictly forbidden.			
	(4) After the construction is completed, grease and wastes in abandoned dreg pits, material yards, construction paths and camps should be removed timely; land should be flattened, the original landscape and vegetation cover should be restored, such that the construction and the surrounding environment are in harmony.			
Safe construction	1. Warning signs should be set up at the posts,			

	<p>equipments and places that are prone to occupational hazards.</p> <p>2. Training on vocational safety and health, and body checks should be organized regularly for those who work in harmful and poisonous environment, teaching them how to adequately use protective equipments and supplies.</p> <p>3. The construction unit should provide workers with protective supplies, such as hamlets, security belts, working boots and uniforms.</p> <p>4. On the construction site, low-noise generating equipments should be used, automatic technologies and indoors operations should be promoted to reduce noise generated. During operation, workers should wear earplugs to protect their hearing.</p> <p>5. In the places where natural ventilation cannot be ensured, e.g., anti-corrosion and water-proofing operation in basements, the air ventilation system should be built. Workers who operate in the harmful and poisonous environment should wear gas masks or protective masks.</p> <p>6. In dusty working environment, measures should be taken to reduce dust, e.g., spraying water; workers should wear masks. When welding, workers should wear protective masks, glasses and gloves.</p> <p>7. During high temperature operations, cooling supplies should be provided on the site, and the operation and resting times should be appropriately managed.</p>			
Health and medical	<p>1. On the construction site, meals, drinking water and the places where workers rest should meet relevant sanitary standards.</p> <p>2. Ventilation and lighting equipments should be installed in dormitories, canteens, shower rooms and toilets. It is necessary to designate persons to be responsible for maintenance.</p> <p>3. In the dormitories on the construction site, operable windows can be installed. Each bunk bed could not have more than three layers. One big bed for all workers in the room is strictly forbidden.</p> <p>4. Canteens must have the valid sanitation permit granted by the relevant authority. All utensils should be clean and meet relevant standards. Cooks must have the valid health certificates.</p> <p>5. Canteens should be away from sources of pollutants, e.g., toilets, trash tanks, and poisonous or dangerous materials.</p> <p>6. In canteens, there should be separate operating rooms and storerooms. Rat guards should be applied under the door (no less than 0.2m).</p> <p>7. Toilets, sanitary equipments, draining and the places in wet and dark areas should be disinfected regularly.</p>			

	<p>8. Closed containers should be installed in residential areas, fly control should be carried out on a regular basis, and removed timely.</p> <p>9. There should be a clinic on the construction site, equipped with the health care kit, commonly used medicines and first aid equipments such as bandage, tourniquet, cervical collar and stretcher.</p> <p>10. The occurrence of contagious diseases, food poisoning and acute occupational poisoning should be reported to local epidemic prevention department and the construction administrative authorities, and handled in line with local epidemic prevention department's requirements.</p>			
During Operation phase				
Controlling environment risks	<p>1. In the wastewater treatment plant, there should be an emergent tank with the necessary equipments such as reflux pumps.</p> <p>2. The operating unit should install on-line monitoring equipments at inlets, outlets and the key water treatment buildings as required by the environment protection authorities and the wastewater treatment administrative units, and connect them to the networks of the environment protection authorities and the wastewater treatment administrative units.</p> <p>3. The inspections of pipelines and inspection pits should be strengthened, in particular the inspection of the newly-built constructions along the pipelines, to avoid the sewers are damaged due to careless construction works.</p> <p>4. The emergent plan for the wastewater treatment plant and the affiliated pipeline network should be compiled.</p>	The owner	PMO, owner, and environment protection bureau, urban and rural construction committee, and water resource bureau of the county (city)	
Water pollution prevention and control	<p>1. The maintenance and management of the pipelines should be strengthened to prevent the pipelines being jammed by sinking sands.</p> <p>2. The design, construction and operation of the wastewater treatment plant and the intercept pipelines should be carried out at the same time.</p> <p>3. Leakage at the intercept pipelines connections should be avoided to prevent environment problems such as groundwater pollution and weakened foundation.</p> <p>4. The internal operation and management of the wastewater treatment plant should be strengthened: operation staff should go through special training programs and their performance should be evaluated, regular testing and analysis should be strengthened, a relatively advanced automatic control system should be established.</p> <p>5. Water consumption should be reduced by reutilizing treated wastewater, reducing the volume of</p>			

	the discharged wastewater and improving the utilization rate of water resources.			
Odor control	<ol style="list-style-type: none"> 1. Closed buildings equipped with deodorization system should be used. It is recommended to use biofilter tanks to deal with the odor. The treatment rate and the removal rate should be no less than 90%. After treatment, the air can be emitted through the exhaust chimney. 2. Three-dimensional afforestation can be applied in the plant (protective belt). At the same time, a green (tree) belt can be built along the boundary of the plant. Solid wastes should be cleaned and removed in a timely way. The sludge dewatering plant, water tanks, and fences can be positioned at the places that are far away from the front area of the plant, away from the boundary in the downwind area. Furthermore, the surrounding areas should be afforested intensively. 3. A certain sanitation protective distance should be kept. 			
Prevention and control of Noise	<ol style="list-style-type: none"> 1. Low-noise and high-quality equipment should be used as much as possible. 2. Noisy production areas should be located in the middle of the plant to reduce the impacts on the surrounding areas and the environmentally sensitive spots. 3. Mobile covers with sound absorbing materials can be used to cover the engines that produce a large amount of noise. In this way, the overall level of the noise created by such engines can be reduced by about 15dB(A). 4. For blowers, appropriate mufflers can be used; soft links can be employed; anti-vibration measures can be applied. Therefore, the noise can be reduced by 20dB(A). 5. In the plant, a tree belt should be built; at the boundary of the plant, a tree belt should be established to separate it from the outside. 			
Solid waste treatment and disposal measures	<ol style="list-style-type: none"> 1. Temporary leakage-proof tanks should be installed and placed under the sheds. Such tanks should be used to hold different types of solid wastes. The leaking wastewater should be collected and treated at the wastewater treatment system. 2. The solid wastes piled up should be transported to the treatment plant by designated vehicles with a closed container. Transportation management should be strengthened to reduce spilling – spilled wastes should be cleaned and removed in a timely manner. 3. The appropriate sludge treatment method should be selected, taking into account the real situation in Pengshui. 			
Groundwater pollution prevention	<ol style="list-style-type: none"> 1. The floor of the solid waste yard should be hardened by a layer of 10-15cm concrete above a layer of clay; epoxide resin should be applied to prevent 			

measures	<p>water leakage.</p> <p>2. The wastewater treatment tanks should be hardened by concrete, the walls should be brick wall hardened by concrete to prevent water leakage. Epoxide resin should be applied to the whole tank to prevent corrosion and leakage.</p> <p>3. The roads in production areas, the area where trash tanks are located, the floors of the maintenance yards and warehouses should be hardened by a layer of 10-15cm concrete on top of a layer of clay.</p>			
----------	---	--	--	--

Annex B: Physical Cultural Resources Management Plan

1 Situation of the Project-related Physical Cultural Resources

1.1 Wanling Ancient Town (also named as Lukong Ancient Town)

The Lukong ancient town has a long history and it is a cultural relic protection site at county level. Its well-preserved ancient streets and architectures cover an area of 3.2 hectares in total, of which most streets were built in Ming and Qing dynasty while the traditional architectures are mainly the Old House and the Gorgeous House of Zhao's family and the Former Residence of Liu Naifu. Based on principles of integral control, key protection and unified coordination, the entire ancient town and its surroundings are set to be a control zone in conservation plan. This zone is further classified into 4 levels for protection, i.e. core conservation, common conservation, construction control and regional coordination. Scope of this zone is shown in figure 1.1. The Lukong ancient town located on the left bank of Lukong district of the project (LaiUpper L1+265.298~LaiUpper L1+325.231). Informed by interviewed administrations of cultural relic protection, the Huguang guild hall and Zhao clan's ancestral hall in Lukong town are located on the left bank of the project. They are protected on county level. With a completed embankment on the left bank of the town, there is no need for further construction in that area.

1.2 Darong Bridge

The left and right bank of Darong Bridge located respectively on left side (LaiUpper L1+265.298~LaiUpper L1+325.231) and right side of the project (LaiUpper R0+611.315~LaiUpper R0+622.984). It is a stone slab bridge, of which the deck consists of stone units weigh 10 tons each. The bridge is 116 meters in length and 1.75 meters in width, connecting the west and east bank of Lukong. Built in early Zhengde period of Ming dynasty, this 24-span bridge now has been a cultural relic protected at municipal level. According to the opinion of cultural relic administrations, its conservation zone stretches two meters from each end of the bridge and 15 meters from its upstream and downstream faces.

1.3 Grand Buddha Temple (Dafu Temple)

Grand Buddha temple is a national emphasis cultural relic unit. It is located on the south bank of Fujiang river at the northern foot of Dingming Mountain, 1.5km to the northwest of Tongnan county. Its area is from the second Fujiang bridge on the north to the old urban district of Tongnan county on the south. It is right next to the Dafu dam district, facing the new urban district on the other side of the river. The Cliffside Buddha coated with gold in Grand Buddha temple is 18.43 meters high, of which the height rank first in china and seventh among world's gold decorated Buddhas. Founded during Xiantong period (A.D. 860~873) of Tang dynasty, the temple's initial name was Dingming, while it can be also called as Nanchan Temple. In Ming dynasty, a seven-story pavilion was built to cover the Buddha, and it has been well preserved ever since. Works of successive celebrities were carved on aged stone walls in the temple, among which pictures named Feixia and Tiankai etc. was of great artistic value. All relics in the temple had been made part of the first batch of provincial-level key protected culture relics by the government of Sichuan Province in august

1956. And the Cliffside Buddha, classified as a relic of the period from Sui dynasty to Qing dynasty, was approved in the list of the 6th batch of national key protected culture relics by the state council of China on May the 25th, 2006.

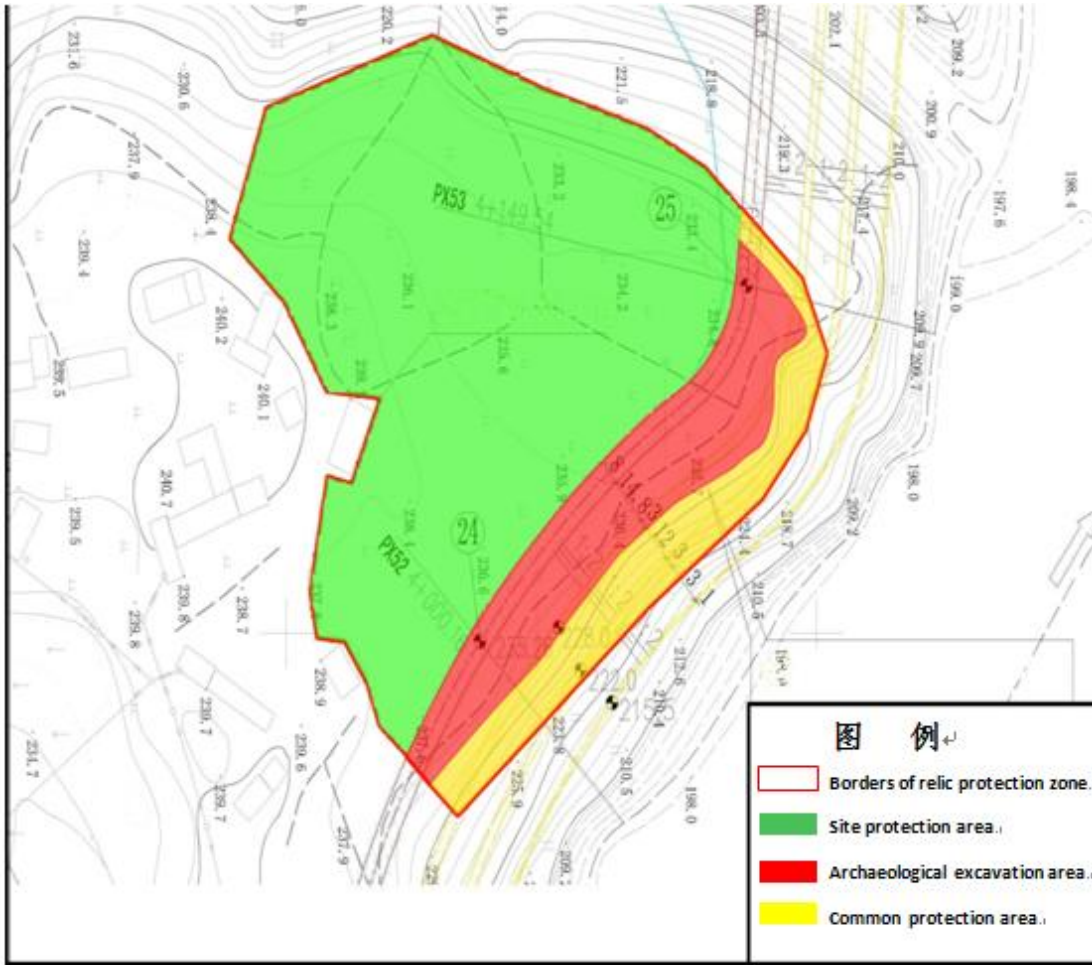
Grand Buddha temple was planned to be a multi-function comprehensive scenic integrated of tourism function, multi-cultural elements of Confucianism and Buddhism and experimental function. Based on such principles as no damage to the existing relics and non-renewable resources, no changes to the existing architectures or its layout, and moderate development of new cultural tourism project in line with the landform features, its scenic plan arranged each function area reasonably. It proposed a three-layer protection zone to consist of a core area, a range control area, and an environmental coordination area to protect the relics respectively. Scope of the protection area is shown in figure 1.2.

This project lies to the northwest of Tongnan Grand Buddha temple with a shortest distance of 500m from the range control area of Grand Buddha Temple (Dafu Temple) protection zone.

1.4 Xujiaba Site

The relic site was one of the settlement ruins of clans existed in Shang and Zhou dynasty. Located at 29°22' 00.9" N, 108° 07' 16.0" E, the east-facing relic site covers an area of about 45000m² in territory of the 9th group of Linjiang village (former 3rd group of Tianchi village) with an altitude of 220m. It is on the 2nd terrace of the left bank of Wujiang River, closed to Wujiang River. Three small rills divide the site into 3 parts. It can be observed that there are 4 cultural layers on the precipice near river. The 1st contains roots and bulbs in its 30cm thick soft taupe soil. The 2nd is 40-50cm thick filed with high ratio sand. The 3rd layer with 50-67cm thick soft reddish brown soil contains sand inclusion, pottery shards decorated with thin corded pattern, rocks and plant ash. And the brown soil in 4th layer is hard and pure. Stone implements collected from the ruin are mainly hammered implements, pottery shards, sand inclusion, and flat bottomed vessels. This considerably valued ruin is preserved rather well except mild corrosion due to long time burial and years of exposure during its early centuries. Additionally, cultivation activities of local villagers before archaeological excavation also had impact on the ruin.

According to *Evaluation of Impact on Xujiaba Site and Culture Relics* and on the basis of *The Cultural Relics Protection Law of the People's Republic of China*, the related part of Xujiaba relic site is proposed to be preserved by site protection and archaeological excavation arrangement. It is planned to be divided as site protection area, archaeological excavation area and common protection area. Scope of each area is shown in figure 1.1. The common protection area has no relics involved, and archaeology activities in archaeological excavation area had been already completed. Construction of the project will only occupy the common zone and archaeological excavation area.



Sketch of Cultural Relic Protection Plan of Xujiaba Site

Legend

- Borders of relic protection zone
- Site protection area
- Archaeological excavation area
- Common protection area



Distant view of Xujiaba Site



Pottery specimens collected in Xujiaba Site



Stone implements collected in Xujiaba Site



Animal bones in K3 stratum of Xujiaba Site

2 Related laws, regulations and policies

2.1 Domestic Laws and Regulations

- (1) *Cultural Relics Protection Law* of the People's Republic of China (1991.6.29)
- (2) *Measures for the Administration of Culture Relics Preservation Projects* (2007.12.8)
- (3) *Principles for the Conservation of Heritage Sites in China* (2004)
- (4) *Regulations of the People's Republic of China on Nature Reserves* (1994.10.9)

2.2 World Bank policy

OP 4.11 Physical Cultural Resources

3 Conclusions of impact analysis

3.1 Wanling Ancient Town

Wanling ancient town lies on the left bank of the project (LaiUpper L1+265.298~LaiUpper L1+325.231). According to the interviewed administrations of cultural relic protection, the Huguang guild hall and Zhao clan's ancestral hall in Lukong town are located on the left bank of the project. As an embankment project is already completed on the left bank of Lukong town, there is no need for further construction. So construction of this project will not cause any disturbance to the relics in Lukong ancient town.

3.2 Darong Bridge

The left and right bank of Darong Bridge locate respectively on left side (LaiUpper L1+265.298~LaiUpper L1+325.231) and right side of the project (LaiUpper R0+611.315~LaiUpper R0+622.984). With a completed embankment project on left bank, there is no need for further construction. So the left bank of Darong Bridge will not suffer any impact. However, the right bank of Darong Bridge is in construction area, so mechanical excavation there may impact the bridge at some level and potentially cause damage to its stability or scene.

According to the opinion of cultural relic administrations, Its conservation zone stretches 2 meters from each end of the bridge and 15 meters from its upstream and downstream faces. So construction of embankment on right bank should be carried out outside the conservation zone. At mean time, reasonable layout of construction near bridge should be put forward and the excavation near bridge is suggested to be carried out manually.

According to the construction arrangement, no construction will be carried out on left bank, construction on right bank will be kept off from the conservation zone, and manual excavation will be carried out on right bank of the bridge. As a result, the project will not

have any impact on the bridge.

3.3 Grand Buddha Temple (Dafu Temple)

The project is on northwest to Tongnan Grand Buddha temple, a state emphasis cultural relic unit. From a route optimization based on researchable data, the final adopted route will avoid the scenic region. The ending point of the route is beside a road on the left bank of 1st group's territory of Shengli Village. It will not go through Shengli weir. And shortest straight-line distance from the route to Dafu Temple control area is 500m. During construction period of this project, its workyard is placed in canal scenic region far off the Grand Buddha temple. Without any important scenic around, it will have little impact on Grand Buddha temple. Transportation of earthwork and other materials will make use of Jingfo Avenue and other main transport arteries around.

EIA requires construction unit to deliver the construction plan to the cultural relic administration of Grand Buddha temple for approval before construction. If cracking or inclining were found during construction period, the construction should be suspended immediately, and construction unit should inform the cultural relic protection units in time. The project cannot be resumed until it is assured that continuous construction will not cause damage to relics in Grand Buddha temple.

There are several protected relic sites in Tongnan County, the 2nd section of the project is located near Dafu Temple (Grand Buddha Temple) state-level key cultural relic. Consequently, it is of great importance to handle well the suspected relics found during construction. The contractor should train the constructors and tell all things about safety technology of handling suspected relics in advance. Once suspected relics appeared, construction unit should suspend the construction, and preserve the site. Then inform cultural relic administrations of Tongnan county and Chongqing city. In brief, construction unit should execute timely site protection and situation report after a sudden appearance of relics. It is construction unit's duty to protect the relics from being damage, concealed or resold.

At present, no actual or suspected cultural relic has been found in both permanent and temporary occupied areas of Dafuba embankment.

3.4 Xujiaba Site

Affected by both natural and human factors, some collapse and erosion are shown on the river bank of Xujiaba Site. To protect the relic site from being eroded by Wujiang River, it is necessary to add slope protection to the whole bank of the relic site section. Based on landform and geological features and borders of the relic protection area, an earth embankment slope-attaching revetment design was proposed, which means a partial occupation of the protection zone is unavoidable. To reduce the occupation of the protection area the shore line could be reallocated outward once goals of flood control were fulfilled. According to figure 6.3-1, the project occupies only part of the riverside of the relic site. Despite certain impact on deposition of the ruin caused by the project, the scope of influenced area is rather small, and the negative influence can be minimized by protection measures. On the other hand, once bank revetment project begins to be operated, the

project will protect the bank and benefit the following protection works of the site. So the site will be protected well to the maximum extent. Additionally, operation of the road on top of the embankment will improve regional traffic conditions which will help stimulate the tourism in Xujiaba Site. It is also good for cultural communications of the site. Over all, operation of the project will help to protect, advertise and develop the value of Xujiaba Site in long term.

4 Management Institutions

The competent authorities for cultural relic administration of Wanling Ancient Town and Darong Ancient Bridge are respectively Rongchang County Cultural Relic Bureau and Chongqing Cultural Relic Bureau, and they are daily managed by Rongchang County cultural relic bureau. The cultural relic administration of Grand Buddha temple and Xujiaba Site is Chongqing Cultural Relic Bureau. Additionally, relevant organizations are World Bank office in Chongqing, project contractor, environmental supervision institutions and environmental monitoring agencies.

5 Protection Measures for Avoiding or Mitigating Impacts

5.1 Handling Procedures for Physical Cultural Resources Discovered in Construction

The basis of the handling procedure is article 32 of the *Law of the People's Republic of China on protection of cultural relics*, which says: "Anybody who finds cultural relics during construction or agriculture production should protect the site and report the situation to local administrations of cultural relic immediately. Without special situation, the administration should rush to the scene in 24 hours, and give advice in 7 days. The administration could appeal to local government to ask for security assistance from police department. If the relics were found of great importance, it should be reported immediately to the state council administration of cultural relic. The relics are state-owned, any unit or individual should not snatch, unauthorized distribute or conceal them.

This plan raises management claims for accidently found of relics during construction period as follow:

If a relic were found during construction, related activities should be suspended, the site should be controlled and prevent form any unauthorized disposal. The construction unit should report the situation to local cultural relic administration immediately.

When disposal advice received, construction unit should enact a construction plan within relic site section based on suggestion from cultural relic administration. Then, the construction can be resumed with the permission from cultural relic administration. Any unit or individual should not resume the construction or production in archaeological excavation area without authorization.

Any snatch, distribution or concealment is prohibited.

The relic handling flowchart is shown in Figure 1.5-1.

5.2 Protection Measures for Grand Buddha Temple

(1) Route selection should avoid Dafu Temple state-level key cultural relic unit and its core scenic area.

(2) Before construction, scheme should be delivered to cultural relic administration to consult and seek permission.

(3) During construction period, if cracking or inclining happened within Grand Buddha temple, construction should be suspended. The construction unit should report the situation to local cultural relic administration immediately. The construction could be resumed only when continuous construction is assured not to cause damage to the protected cultural relics in Grand Buddha temple.

(4) Construction equipment should be settled far off temple area when construction near Grand Buddha temple carried out. And works with strong vibration is advised to be avoid near the protection area

(5) If suspected relic were found during construction, construction should be suspended. The construction unit should report the situation to local cultural relic administration immediately. Construction could not be resumed until excavation is completed.

(6) Connect the embankments near Grand Buddha temple to form an integrity flood control system. Strengthen the monitoring of water level of Fujiang river.

5.3 Protection Measures for Darong Bridge

(1) Not to carry out construction on left bank. Construction near the ancient bridge will be operated out of the set protection area to avoid affecting the bridge.

(2) For less vibration impact, artificial excavation solution will be adopted. Excavation activities will be out of the conservation zone.

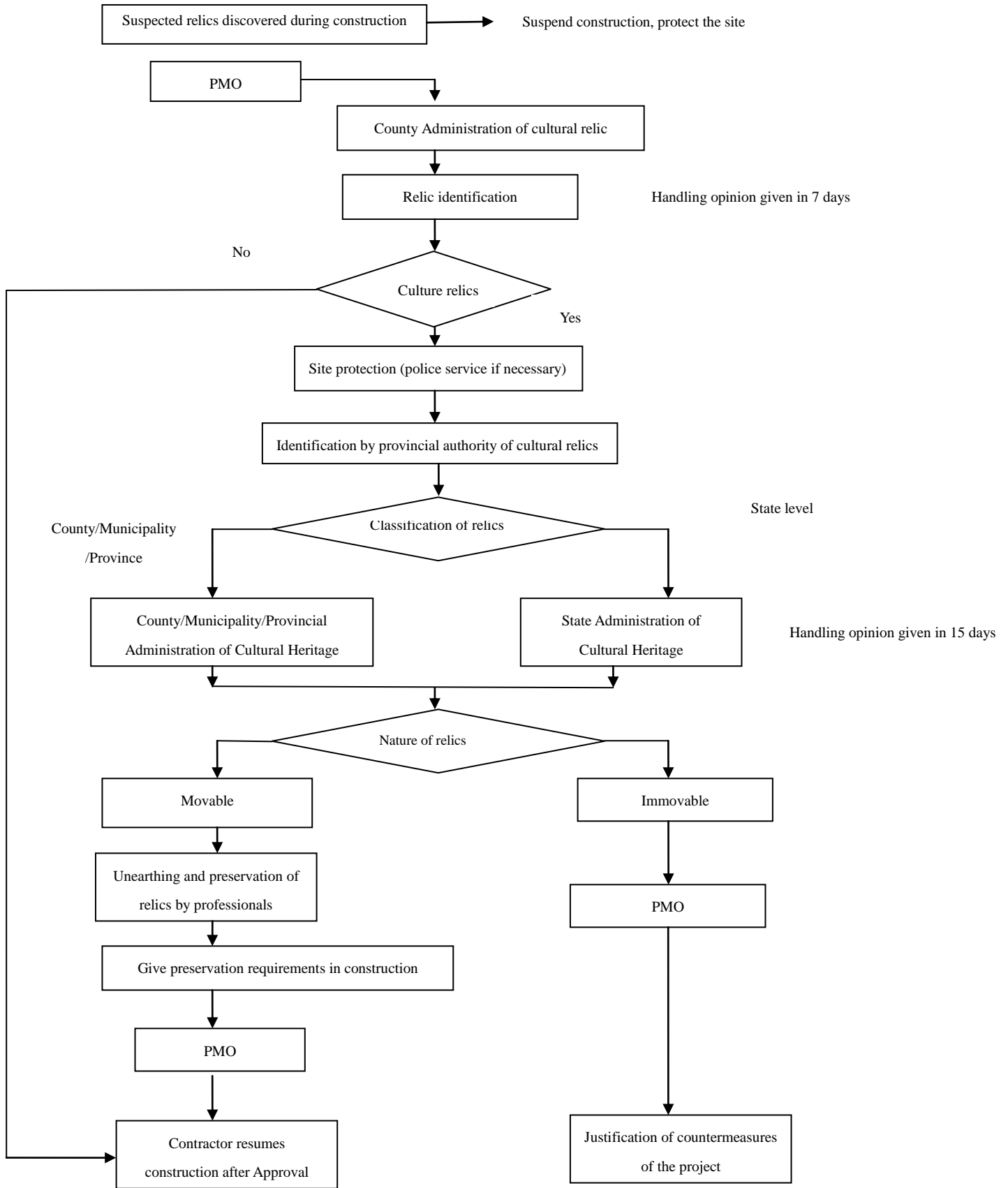


Figure 5-1. Handling Procedures for Relics Discovered in Construction

(3) Before construction, construction unit should hand over the construction plan to cultural relic protection administrations of Darong Bridge.

(4) Set a fixed monitor on right bank of Darong Bridge. If cracking or inclining were observed within the bridge, construction unit should suspended its work immediately, and inform cultural relic protection units. The construction could be resumed only when continuous construction is assured not to cause damage to the bridge.

(5) Connect the project with existing embankments, form an integrity flood control system, and strengthen the monitoring and forecast of water level of flood.

5.4 Protection Measures for Xujiaba Site

Set a protection area for the original site, the proprietor of the project should adjust the plan on land use appropriately to avoid occupying the protection area.

(1) Execute protection for the relic site in strict accordance with the set original site protection area. Before construction, the proprietor of the project together with cultural relic administration should determine the scope of original site protection area, and set up alarm marks.

(2) Proprietor should adjust the construction plan to avoid rolling, excavation, burial, material stacking works in the original site protection area, and not change the ground environment of the relic site.

(3) Because of municipal construction like underground pipeline construction, it is impossible to avoid conducting some excavation work within original site protection area. In this case, detailed plans and drawings of the excavation should be provided for administrative permission, followed by handing in of a separately compiled work plan. Then, construction could be conducted after archaeological excavation

(4) If relics were accidentally found during construction, the construction should be suspended immediately, and situation report to cultural relic administration should be delivered in time. Construction could not be resumed until relevant administrations authorized.

6 Training

(1) Participants

Environmental supervisors, delegates of project contractor

(2) Contents

- ① Laws, regulations and theory of relic protection
- ② Relevant technical specifications and basic skills
- ③ Physical cultural resources management plan
- ④ Environmental management stipulations of this project,

7 Monitoring Plan

Construction period: In accordance with the List of Identified Environmental Impact Factors, vibration of the machines during construction will impact on the relics to some extent. However, since there is not any large vibration source and the construction period is short, the impact shall be rather small. Therefore, monitor on vibration will not be done. During the construction period, a qualified supervising entity should be employed to provide a full-course supervision service.

Huangjiaotang

Xibutang Pawning Ground

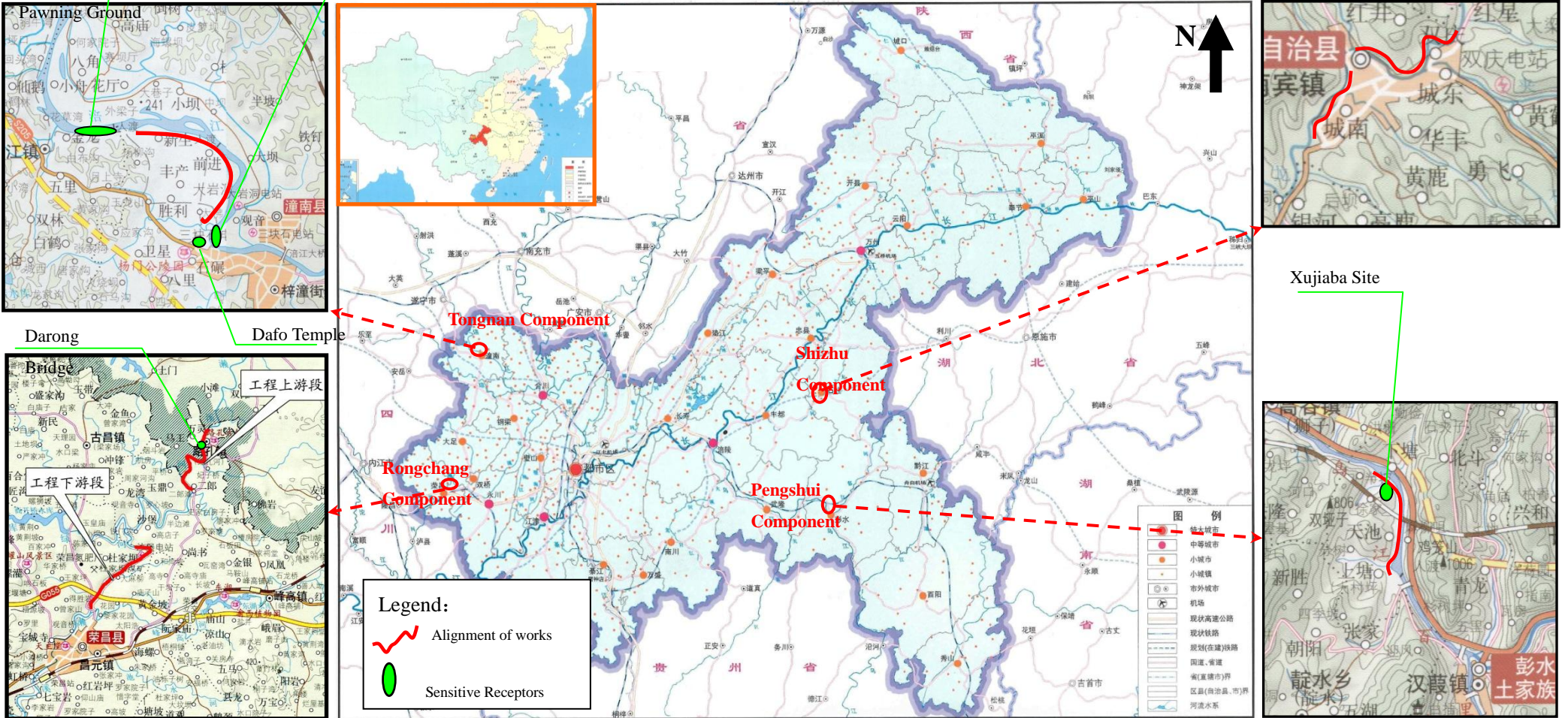


Figure 1 Important Sensitive Receptors