贵州省环境科学研究设计院

Guizhou Tongren Rural Road Project

Environmental Impact Assessment

（EIA-B）

GUIZHOUSHENG ENVIRONMENTAL PROTECTION SCIENCE RESEARCH & DESIGN INSTITUTE

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3. National Development and Reform Commission of Guizhou, Guizhou NDRC Foreign Investment[2013] No. 2184 "Notice of Approval on Optional Project Plans Financed by World Bank Loan in 2014-2016 Fiscal Years", Aug. 2013;
4. Documentary evidences from relevant departments of Dejiang County and Sinan County;
5. Sinan Housing and Urban-rural Construction Bureau, Sinan Housing Letter [2014] No. 88 and 89 "Reply to the Relevant Problems on the Traffic Infrastructure Construction Declared by Road Transport Bureau to World Bank Loan", Nov. 12, 2014;
6. Sinan Forestry Bureau, Sinan Letter [2014] No.5 "Reply to the Influences on Scenic Spots and Vegetation from Two Construction Projects of Roads from Shangguanqing Yangjiaao County to Langantong Village of Sinan Forestry Bureau", Nov. 11, 2014;
7. Transport Bureau of Dejiang County and Sinan County, Letter of

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1 Introduction

1.1 Project Background and Information Overview

1.1.1 Project Background

As a "Renowned City in West China", Tongren is one of the six prefecture-level cities under the jurisdiction of Guizhou, People's Republic of China. It is located in northeastern Guizhou, in the middle of Wuling Mountains, and neighbors Xiangxi Tujia and Miao Autonomous Prefecture and Huaihua City in Hunan and Xiushan County in Chongqing; Wujiang River runs through the region. Guizhou is a province in west China inhabited by multiple ethnic groups, which is also an underdeveloped province with the most prominent poverty problem. Poverty and backwardness are the province's primary contradiction. Tongren is the province's "underdeveloped, underexploited" region, which is a typical "old, minority, border and impoverished" region. In order to support the province to seize the historic opportunity of further implementation of Western Development Strategy so as to vigorously implement the powerful industrial province and urbanization driven strategies with development acceleration, transformation speeding up and leapfrogging promotion as the keynotes, the State Council approved and issued the *Regional Development and Poverty Alleviation Program for Wuling Mountain Area* and the *Several Opinions on Further Promoting Sound and Rapid Economic and Social Development in Guizhou* (Document No. (2012) 2) successively in October 2012 and January 2013. These have been the comprehensive policy documents about systematic support of our provinces' development at the national level since the 1990. *Regional Development and Poverty Alleviation Program for Wuling Mountain Area* and the *Several Opinions on Further Promoting Sound and Rapid Economic and Social Development in Guizhou* are of epochal milestone significance for promoting the sound and rapid economic and social development of Tongren, accelerating the pace of eliminating poverty and becoming better off, and achieving the goal of building a moderately prosperous society. In order to implement the *Regional Development and Poverty Alleviation Program for Wuling Mountain Area* and the *Several Opinions on Further Promoting Sound and Rapid Economic and Social Development in Guizhou*, it is imperative to give full play to Tongren's geographical advantage as Guizhou's transportation hub connecting Hunan, Hubei and Chongqing, accelerate the construction of modern integrated transport system, and accelerate the construction of transportation infrastructure according to the municipal party committee and government's arrangements. Rural road construction, in particular, is also a livelihood project, which plays an important role in promoting the improvement of internal road network construction in Tongren.

In order to effectively address the rural transportation problem in Tongren, construction of rural roads should be accelerated, rapid development of rural economy and progress of rural social civilization should be promoted, security facilities in rural roads should be improved, and safety threats in rural roads should be eliminated gradually through governmental guidance and investment, villagers' active participation and wide social support taking full implementation of scientific outlook on development and improvement of rural residents' standards of production and living as the tenets, settling of rural "three routes" (export route, economic route and cut-through route) as the emphasis, and formation of fully functional rural road network as the goal, thereby creating favorable highway traffic conditions for building of a moderately prosperous society in an all-round way. In order to better adapt to the demands of rapid economic and social development, and maximize the convenience of production and life for rural residents, after careful study, the municipal party committee and government decided to implement the World Bank loaned transportation project centering on rural roads. The World Bank loaned transportation project is important measures for improving the structure of rural roads, raising rural residents' living standards, and building new socialist countryside, which is one of practical public projects implemented by municipal party committee and government.

Construction of Guizhou Tongren Rural Road Project Financed by the World Bank Loan involves two backward counties, i.e. Dejiang and Sinan, in the western part of Tongren, see Figure 1.1-1 Geographical Location of Proposed Project. Its construction will lay the foundation for "poverty reduction and rejuvenation" of Dejiang and Sinan and for "keeping pace with the nation to realize the grand goal of building a well-off society in 2020". Meanwhile, it will also play a demonstrative and leading role, greatly coordinate urban-rural development, enhance the vitality of rural development, gradually narrow the development gap between eastern and western and between urban and rural areas, speed up the building of a well-off society in an all-round way, and has an important significance for Tongren to achieve better and faster development of economy and society.

1.1.2 Information Overview

Guizhou Tongren Rural Road Project Financed by the World Bank Loan is composed of rural road, new bridge and ability building projects for Dejiang and Sinan, which includes the following construction contents:

(1) Dejiang Rural Road Construction Project, which includes construction of 59 class-Ⅳ roads with a total length of 415.705 km, and 18 bridges 539.5 m in total length;

(2) Sinan Rural Road Construction Project, which includes 27 class-Ⅳ roads with a total length of 230.717 km, and 12 bridges 298.5 m in total length;

(3) Ability Building Project, which includes assistance, training and inspection for rural road development planning.

In accordance with the *Law of the People's Republic of China on Appraising of Environment Impacts* and the State Council Decree No. 253 *Regulations on the Administration of Environmental Protection Concerning Construction Projects* (1998) and relevant provisions on environmental impact assessment system for construction projects, as well as relevant laws, regulations, environmental impact assessment policy and technical guidelines of the World Bank, after field inspection by World Bank delegation and relevant environmental impact assessment experts, the project is determined to be preprated in the form of the World Bank's class EIA-B report given the nature of this project which has small potential environmental impact. The construction agencies Dejiang County Transport Bureau and Sinan County Transport Bureau commissioned our institute in July 2014 for assessment of environmental impacts regarding the Guizhou Tongren Rural Road Project Financed by the World Bank Loan, and preparation of an environmental impact report (EIA-B). The assessment agency prepared the *Environmental Impact Report under Guizhou Tongren Rural Road Project Financed by the World Bank Loan (EIA-B)* (Draft) on the basis of field investigation and survey, as well as data collection, research and analysis for World Bank's review and approval, so that it can serve as the basis for project construction and environmental management.

The preparation of report and survey research have been supported and assisted by governments and relevant departments of Guizhou Province, Tongren City, Dejiang County and Sinan County, as well as design agencies and experts. We would like to express our heartfelt thanks to them!

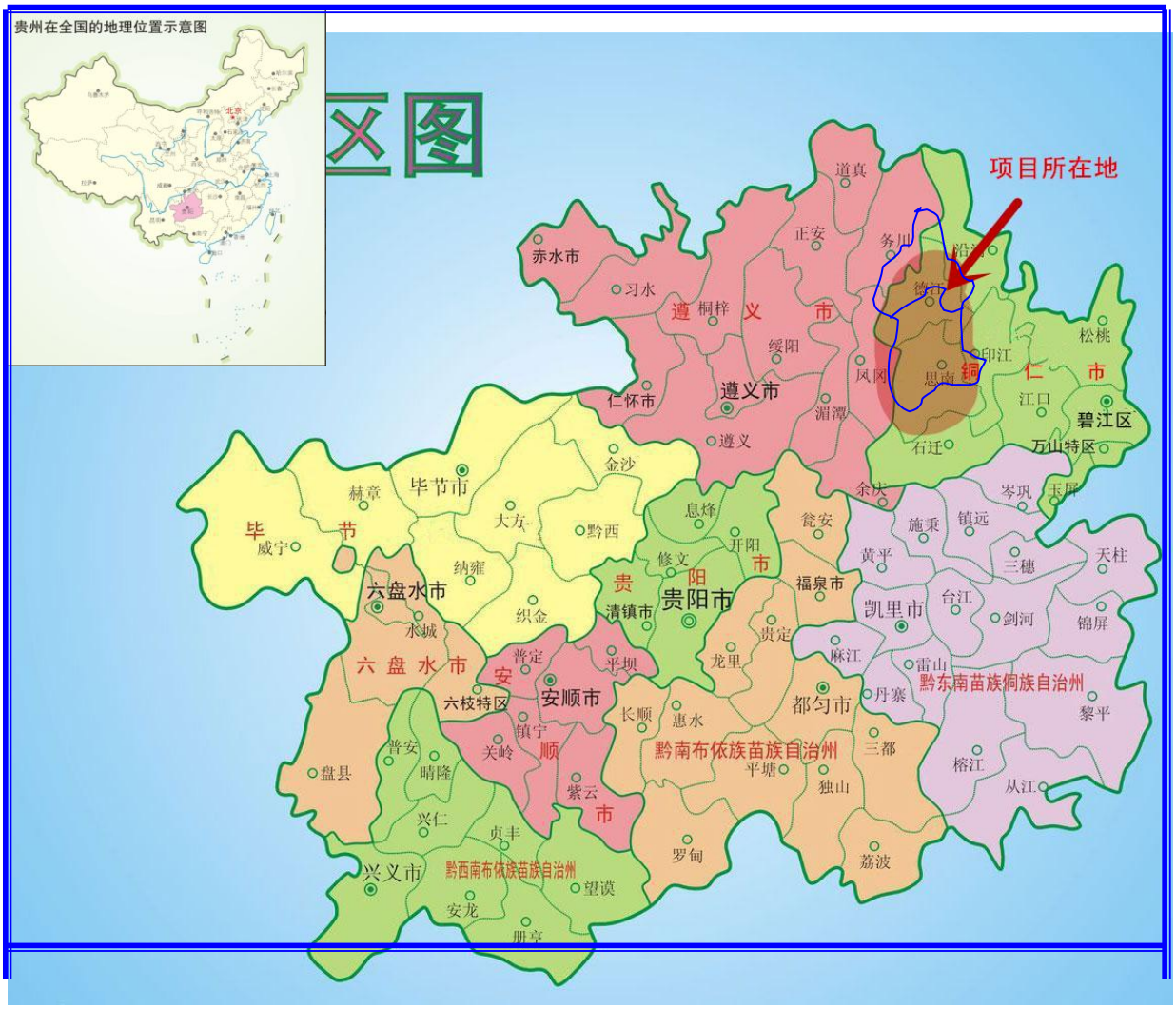


Figure 1.1-1 Geographical Location of Proposed Project

1.2 Relevant Laws, Regulations and Policy Requirements

1.2.1 Laws and regulations

● National laws and regulations

1. Environmental Protection Law of the People's Republic of China (1989.12);

2. Law of the People's Republic of China on Appraising of Environment Impacts (2003.9.1);

3. Law of the People's Republic of China on Water and Soil Conservation (2012.3.1);

4. Land Administration Law of the People's Republic of China (2004.8.28);

5. Law of the People's Republic of China on Prevention and Control of Atmospheric Pollution (2000.4.29);

6. Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise (1996.10);

7. Road Law of the People's Republic of China (2004.8);

8. Water Pollution Prevention and Control Law of the People's Republic of

China (2008.6.1);

9. Law of the People's Republic of China on Prevention and Control of Environmental Pollution by Solid Wastes (2005.4.1);

10. Forest Law of the People's Republic of China (1998.4);

11. Grassland Law of the People's Republic of China (1985.6);

12. Law of the People's Republic of China on Protection of Wildlife (2004.8);

13. Urban and Rural Planning Law of the People's Republic of China (2008.11);

14. Cleaner Production Promotion Law of the People's Republic of China (2003.1.1);

15. Flood Control Law of the People's Republic of China (1998.1.1);

16. Cultural Relics Protection Law of the People's Republic of China (2002.10.28);

17. State Council Decree No. 257 *Regulations on the Protection of Basic Farmland* (1999.1.1);

18. State Council Decree No. 253 *Regulations on the Administration of Construction Project Environmental Protection* (1998.11);

19. Law of the People's Republic of China on Protection of Terrestrial Wildlife (1992);

20. Regulations of the People's Republic of China on Protection of Wild Plants (1997.1.1);

21. Regulation for the Implementation of the Cultural Relics Protection Law of the People's Republic of China (2003.7.1);

22. State Council Issuance No. (1996) 038 *National Outline of Ecological Environmental Protection* (2001.3.2);

23. State Council Issuance No. (2005) 39 *Decision of the State Council on Implementing Scientific Outlook on Development and Enhancing Environmental Protection* (2005.12)

24. State Council Issuance No. (2012) 2 *Several Opinions of the State Council on Further Promoting Sound and Rapid Economic and Social Development in Guizhou* (2012.1.12);

25. Regulations on Scenic and Historic Areas (2006.9.6);

26. Regulations of the People's Republic of China on Nature Reserves (1994.10.9);

27. Catalogue for Guiding Industrial Restructuring (2011 Edition);

28. Catalogue for Classified Administration of Environmental Impact Assessments for Construction Projects (2008.10.1);

29. Notice on Strengthening Environmental Impact Assessment Works for

Construction Projects Financed by International Financial Organizations (1993.6);

● Local regulations and administrative provisions

1. Regulations of Guizhou Province on Environment Protection (2009.6);

2. Regulations of Guizhou Province on Protection of Basic Farmland (Guizhou Provincial People's Congress, 1999.9.25);

3. People's Government of Guizhou Province Letter No. (2006) 117 *Reply of Provincial People's Government on Water Function Zoning in Guizhou*, as well as Guizhou Provincial Water Resources Department and Guizhou Provincial Environmental Protection Bureau's *Water Function Zoning in Guizhou* Province (2006);

4. Ecological Function Zoning in Guizhou Province (Guizhou Provincial Environmental Protection Bureau, 2005.5);

5. Measures of Guizhou Province on Protection of Terrestrial Wildlife (People's Government of Guizhou Province, 1992.10.17);

6. Measures of Guizhou Province on Protection of Wildlife Resources (People's Government of Guizhou Province, 1995.07.28);

7. Regulations of Guizhou Province on Protection of Cultural Relics (Guizhou Provincial People's Congress, 2005.9.23);

8. Regulations of Guizhou Province on Scenic Spot Management (People's Government of Guizhou Province, 1995.07.28);

9. Regulations of Guizhou Province on Protection of Ethnic and Folk Cultures, 2002.7.30;

10. Decision of the People's Government of Guizhou Province on Several Issues Concerning Environmental Protection, 1999.6;

11. Special Plan of Guizhou Province for Ecological Construction and Environmental Protection during the "12th Five-Year Plan"

12. Tongren Regional Administrative Office Document No. (1994) 93 *Provisions on Water Environmental Function Zoning in Tongren Regional Waters*

1.2.2 Policy Requirements

●Technical Specifications

1. HJ2.1-2011 *Technical Guidelines for Environment Impact Assessment-General Principles,* 2012.1.1;

2. HJ2.2-2008 *Technical Guidelines for Environmental Impact Assessment-Atmospheric Environment,* 2009.4.1;

3. HJ/T2.3-93 *Technical Guidelines for Environmenalt Impact Assessment-Surface Water Environment;*

4. HJ2.4-2009 *Technical Guidelines for Environmental Impact Assessment -Acoustic Environment,* 2010.4.1;

5. HJ 19-2011 *Technical Guidelines for Environmental Impact Assessment-Ecological Impact, 2011;*

6. HJ 610-2011 *Technical Guidelines for Environmental Impact Assessment-Groundwater Environment, 2011*

7. GB50433-2008 *Technical Guidelines for Conservation of Water and Soil for Development and Construction Project;*

8. HJ/T192-2006 *Technical Guidelines for Ecological Environmental Conditions Assessment (trial),* May 1st, 2006;

9. HJ/T169-2004 *Technical Guidelines for Construction Project Environmental Risks Assessment,* December 11th, 2004;

10. JTG B04-2010 *Design Specifications for Highway Environmental Protection*;

11. [2006] No. 28 File Issued by Ministry of Environmental Protection *Interim Procedures of Environmental Impact Assessment Public Participation*, March 18th, 2006;

12. [2005] No. 152 File Issued by Ministry of Environmental Protection *Notice about Strengthening Environmental Impact Assessment Management and Prevent Environmental Risks*;

13. GB50434-2008 Water and Soil Loss Prevention Standards of Development and Construction Project;

14. [2010] No. 7 File Issued by Ministry of Environmental Protection *Techniques Policy of Ground Transportation Noise Pollution Prevention;*

● Relevant Policies of the World Bank

1. The World Bank Operation Manual-Environmental Assessment (OP4.01);

2. The World Bank Operation Manual-Natural Habit (OP4.04);

3. The World Bank Operation Manual-Material Culture Resources (OP4.11);

4. The World Bank Operation Manual-Involuntary Settlement Policy (OP 4.12);

5. *BP17.50 Information Disclosure Policy;

6. *General Guidelines of Environment, Health and Safety*;

● Project Files and Materials

1. [2013] No. 1276 File Issued by National Development and Reform Commission, Ministry of Finance and NDRC Foreign Capital Department, "Ask for Instructions about Utilizing the World Bank Loan for 2014-2016 Fiscal Year Alternative Project Plan", July 2013;

2. [2013] No. 1483 File Issued by National Development and Reform Commission, Ministry of Finance and NDRC Foreign Capital Department, "Notice about Ask for Instructions about Utilizing the World Bank Loan for 2014-2016 Fiscal Year Alternative Project Plan", July 2013;

3. [2013] No. 2184 File Issued by Guizhou Province Development and Reform Commission, Guizhou NDRC Foreign Capital Department, "Notice about Proposal Reply of Utilizing the World Band Loan for Tongren, Guizhou Province Rural Highway Project", August 2013;

4. *The Twelfth Five-Year Plan Outlines of National Economic and Social Development for People's Republic of China*;

5. *The Twelfth Five-Year Plan Outlines of National Economic and Social Development for Guizhou Province*;

6. *The Communication and Transportation Poverty Alleviation Plan for Tongren in Wuling Mountain Area* (2013-2015);

7. *The "Twelfth Five-Year" Plan Outlines of National Economic and Social Development for Tongren City;*

8. *Guizhou Province Highway Network Plan (1991-2020)* Edited by Communications Department of Guizhou Province;

9. *Guizhou Province Rural Highway Development Plan* (2000-2020);

10. *Tongren Integrated Transport Plan*;

11. *Tongren Arterial Highway Network Plan*;

12. Tongren Tourism Development Plan;

13. *Tongren* "*Twelfth Five-Year" Rural Highway Plan;*

14. *Guizhou Province Rural Highway Development Plan* (2000-2020);

15. *Tongren Overall Urban Plan (1999-2030)*;

16. *Dejiang County Integrated Communication Plan (2011-2015)*;

17. *Sinan County Communication and Transportation Development "the Twelfth Five-Year" Plan*;

18. Shenzhen Municipal Design & Research Institute Co., Ltd., *Feasibility Study Report of Tongren Rural Road Project Financed by the World Bank Loan*, November 2014;

17. Wuhan University, *Resettlement of Inhabitant Plan of Tongren, Guizhou Rural Road Project Financed by the World Bank Loan*, November 2014;

18. Wuhan University, *Social Impact Assessment Report of Tongren, Guizhou Rural Road Project Financed by the World Bank Loan,* November 2014*;*

19. Documentary Evidence Issued by Relevant Departments of Dejiang and Sinan County;

20. [2014] No. 88 and 89 Letters Issued by Sinan County Housing, Urban and Rural Construction Bureau, "Reply Letter to Relevant Issues of Transportation Infrastructure Construction Declared to World Bank for Loan by Road Transport Bureau", November 11th, 2014;

21. [2014] No. 5 Letter Issued by Sinan County Forestry Bureau, "Reply Letter to the Impact to Scenic Spot and Plant Cover of the Two Highway Construction Projects from Shangguan Qing, Yangjia ao Village to Langan Tong Village, by Sinan County Forestry Bureau", November 11th, 2014;

22. Letter of Authorization Issued by Dejiang and Sinan County Transport Bureau, July 2014.

1.3 Assessment Executive Standards

1.3.1 Environmental Quality Standards

1. Ambient Air: Sinan Siye Tun Nature Protection Area and Longdi Jiang Scenic Spot Area execute the first level standard according to *Ambient Air Quality Standard* (GB3095-1996). The other areas execute the second level standard according to [2000] No. 1 "Notice about Issuing the *Ambient Quality Standard* (GB3095-1996) Modification List" issued by *Ambient Air Quality Standard* and

State Environmental Protection Administration. The standard values refer to table 1.3-1.

Table 1.3-1 Ambient Air Quality Standard Unit: mg/Nm^3

Pollutant		**(NO_2)**	**(TSP)**
GB3095-1996 first level standard	Per day	0.08	0.12
	Per hour	0.12	/
GB3095-1996 second level standard	Per day	0.12	0.30
	Per hour	0.24	/

2. Acoustic Environment: Area within 35m to the highway frontier executes 4a level standard according to *Acoustic Environment Quality Standard* (GB3096-2008); Sensitive objectives like school and hospital ward within this scope execute the second level standard; Area beyond 35m executes the second level standard. The standard values refer to table 1.3-5.

3. Surface Water: The surface water in the assessment area executes Ⅱ and Ⅲ level standards according to *Surface Water Environmental Quality Standard* (GB3838－2002). The standard values refer to table 1.3-2.

Table 1.3-2 Surface Water Environmental Quality Standard (extract) Unit: mg/L (except for pH)

Item	**pH**	**COD**	**BOD_5**	**DO**	**petroleum**	**NH_3-N**	**permanganate index**
Ⅱ level standard	6-9	≤15	≤3	≥6	≤0.05	≤0.5	≤4
Ⅲlevel standard	6-9	≤20	≤4	≥5	≤0.05	≤1.0	≤6

4. Ground Water: execute Ⅲ level standard according to *Ground Water Quality Standard* (GB/T14848-93), as table 1.3-3 shows.

Table 1.3-3 Ground Water Quality Standard (extract) Unit: mg/L (except for pH)

Item	**pH**	**Total hardness**	**nitrate（calculate in N）**	**sulfate**	**cyanide**	**Total coliforms(pcs/L)**	**NH_3-N**	**permanganate index**

III level	6.5-8.5	≤450	≤20	≤250	≤0.05	≤3.0	≤0.2	≤3.0

1.3.2 Discharge Standard of Pollutant

1. Noise: During the construction period, the noise executes *Noise Limit in Construction Site* (GB12523-90), and the specific standard values refer to table 1.3-4. During operation period, the noise executes "[2003] No. 94, *Notice about Ambient Noise Relevant Issues in Environmental Impact Assessment of Highway and Railway (including Light Rail) Construction Project*". Refer to table 1.3-5 for relevant standards.

Table 1.3-4 Construction Site Noise Limit Unit: dB(A)

Construction stage	Major noise source	Noise limit	
		Daytime	Nighttime
Earthwork	soil shifter, excavator, loader	75	55
Structure	concrete mixer, vibrator, electric saw	70	55
Fitment	crane, lift	65	55

Table 1.3-5 Operation Period Acoustic Environment Assessment Standard Value Unit: dB(A)

Category or sensitive objective	Daytime	Nighttime
GB 3096-2008 4a level	70	55
outside school classroom	60	50
outside hospital ward	60	50

2. Waste water: During construction period, the industrial waste water should be reused after process and not discharge outside; the construction site should adopt closed septic-tank, and the domestic sewage should be used to fertilize or irrigate crops after processed, disinfected and sterilized. The crops irrigation waste water should comply with the *Water Quality Standard for Farm Irrigation* (GB5084-2005), as show in table 1.3-5.

Table 1.3-5 Water Quality Standard for Farm Irrigation Unit: mg/L (except for pH)

Crops kind	pH	COD	BOD_5	SS

water crop	5.5-8.5	150	60	80
dry crop		200	100	100

3. Waste gas: the asphalt fume executes *Integrated Emission Standard of Air Pollutants* (GB16297－1996), as show in table 1.3-6.

Table 1.3-6 Asphalt fume (new pollutant source) emission standard Unit: mg/ m^3

Pollutant	**Production process**	**maximum allowed emission concentration（mg/m^3）**	**inorganization emission monitoring concentration limit**
asphalt fume	asphalt pavement	40～75	no obvious inorganization emission allowed

4. Water and Soil Loss Assessment Standard

The water and soil loss assessment standard takes the average water and soil loss quantity of the highway passing area as reference, and classified according to *The Industrial Standard of People's Republic of China---Soil Erosion Classification and Grading Standard* (SL190-2007) as showed in table 1.3-7.

Table 1.3-7 Grading standard of soil erosion intensity

GRADE	**[$t/(km^2 \cdot a)$]**
Mired erosion	<200，500，1000
Mild erosion	200，500，1000～2500
Moderate erosion	2,500～5000
Intensitive erosion	5,000～8000
high-intensitive erosion	8,000～15000
Fierce erosion	>15000

1.4 Assessment Range and Assessment Method

1.4.1 Assessment Range

The assessment range of each assessment content referring to the planned project is shown in table 1.4-1.

Table 1.4-1 List of Assessment Range

Environmental element	**Assessment Range**
Ecological environment	planned highway, areas within 200m of each side of the bridge center line, rural highway maintenance base, quarry yard, soil digging and discarding field, ground, soil, plant cover, crops, animals, etc.

Acoustic environment	highway, areas within 200m of each side of the bridge center line, areas 100m apart from the border of rural highway maintenance base and other operating areas
Water environment	the upstream 100m to downstream 1000m of the highway, bridge across or passed river section; upstream 100m to downstream 1000m water near the outlet of receiving waters in rural highway maintenance base
conservation of water and soil	area of coverage by highway, bridge and rural highway maintenance base digging and filling earthwork, especially the quarry yard, soil borrow area and spoil ground
Ambient air	200m to each side of highway and bridge center side, 5000m around rural highway maintenance base
Social environment	project direct area of coverage

1.4.2 Assessment Method

It follows the principle of "taking spot and representative district as the principal area, combining spot and section, and feeding back to the entire route" to assess.

1. It adopts the method of combining investigation, analogy analysis and pattern prediction to analyze the acoustic environment, ecologic environment, water environment, water and soil loss assessment and ambient air. It adopts the method of investigation and analysis to analyze the social environment, living quality and pubic participation.

2. Assess the main environmental protection objectives point-by-point.

1.5 Assessment Emphasis

The assessment emphasis is about the ecologic environment and acoustic environment, as well as the ecologic protection, pollution prevention countermeasure during construction period and operating period, and the water environment protection during construction period.

2 Project Description

2.1 Project Overview

Project Name: Tongren, Guizhou province rural road project financed by the world bank loan

Project Executing Unit: Dejiang County Transport Bureau, Sinan County Transport Bureau

Project Location: Dejiang County and Sinan County in Tongren City

Project Range: plane, vertical and lateral side of road, main bridge and network of drains

Construction Type: Highway reorganization and expansion, bridge new construction

Scale and Content of Construction: the project is consist of 86 rural highways, 30 bridges and other capacity construction projects (as figures 2.1-1 and 2.1-2 show). The main construction content as follows:

(1). The rural highway construction contains 59 ones in Dejiang County, adds up to 415.705 km, and 27 ones in Sinan County, adds up to 230.717 km. The total planned four level highway is 86 ones, which is up to 646.422 km. Details are shown in table 2.1-1.

(2) The bridge construction contains 20 small bridges, adds up to 423 m; 10 medium bridge and adds up to 415 m; the total length of these 30 bridges is 838 m. Among these 30 bridges, there are 18 for Dejiang County and 12 for Sinan County. Details are shown in table 2.1-2.

(3) The capacity construction project contains the technical support, training and survey of rural highway development planning.

Construction Duration: start from 2015, completed in 2019 and be open to traffic in 2020. The construction duration is five years.

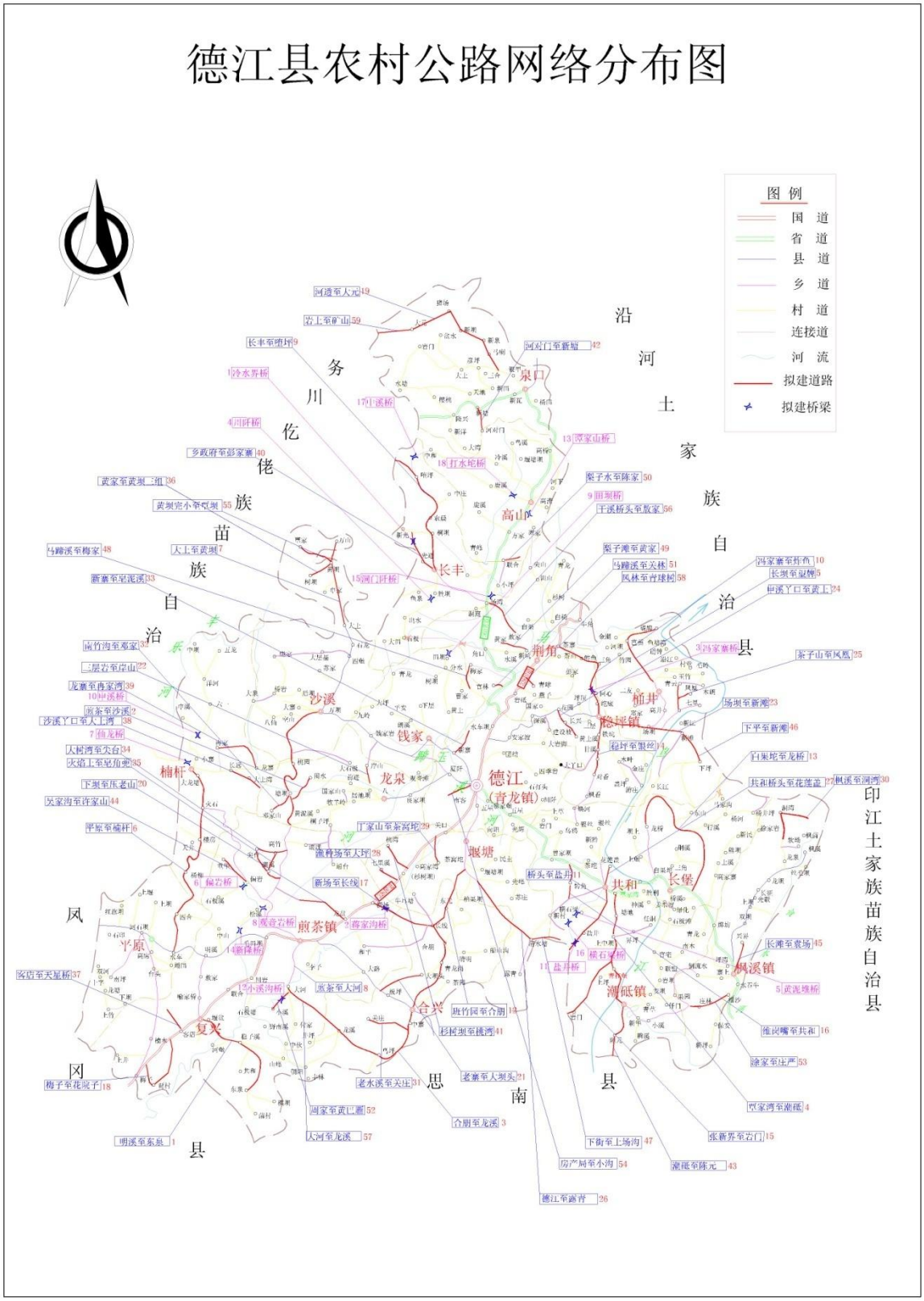


Figure 2.1-1 Partial sketch map of Tongren Rural Road Dejiang County Project Financed by World Bank

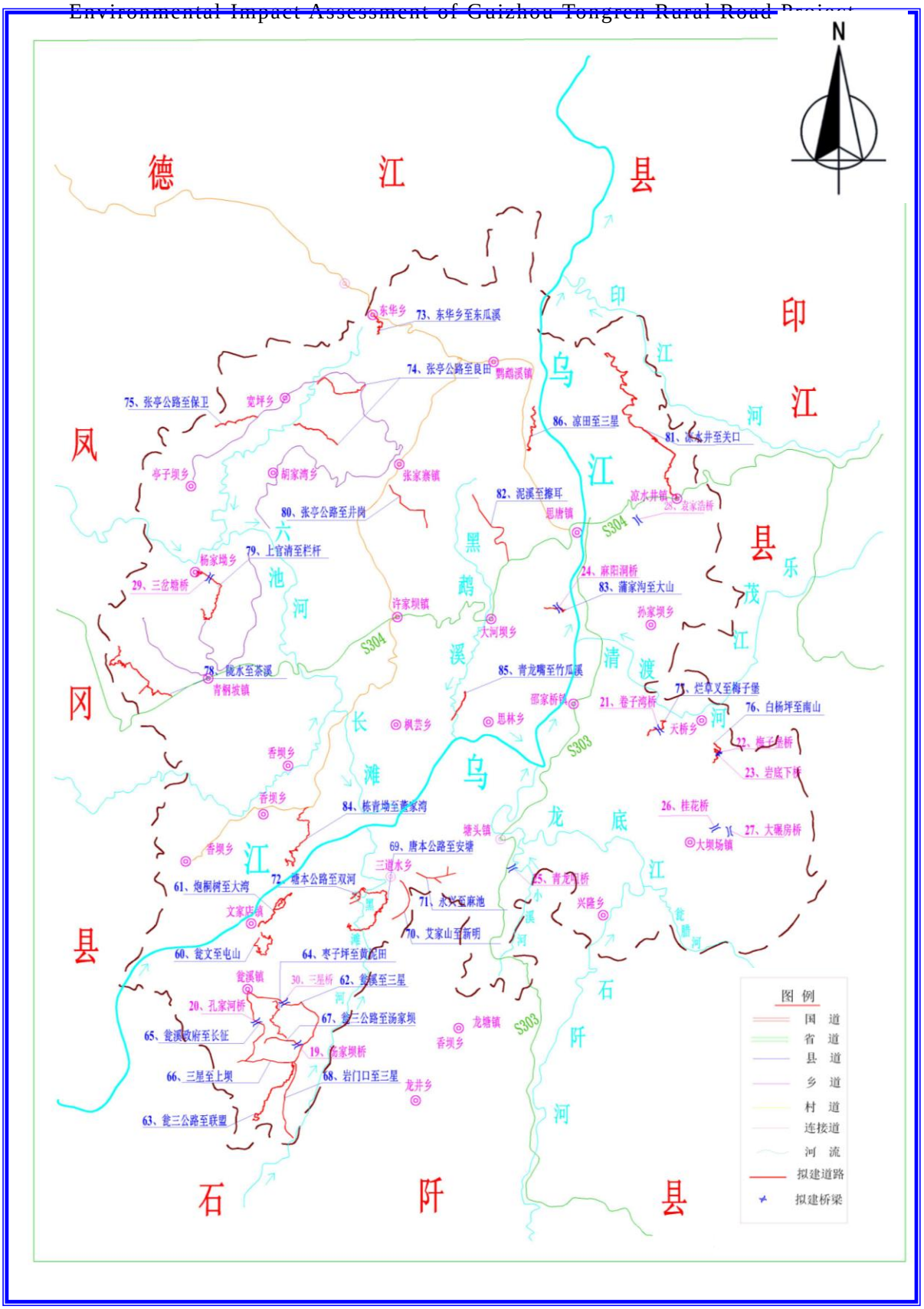


Figure 2.1-2 Partial sketch map of Tongren Rural Road Sinan County Project Financed by World Bank

Table 2.1-1 Planned Highway List

Serial number	County	Highway name	Type of construction	Total mileage（km）	Roadbed width（m）	Road surface material
1	Dejiang County	Mingxi to Dongquan	Rebuild	10.578	6.5	Asphalt
2	Dejiang County	Jiancha to Shaxi	Rebuild	22.133	6.5	Asphalt
3	Dejiang County	Hepeng to Longxi	Rebuild	15.760	6.5	Asphalt
4	Dejiang County	Tanjia Wan to Chaodi	Rebuild	10.205	6.5	Asphalt
5	Dejiang County	Changba to Wangpai	Rebuild	8.965	6.5	Asphalt
6	Dejiang County	Pingyuan to Nangan	Rebuild	21.324	6.5	Asphalt
7	Dejiang County	Datu to Huangba	Rebuild	9.156	6.5	Asphalt
8	Dejiang County	Jiancha to Dahe	Rebuild	4.654	6.5	Asphalt
9	Dejiang County	Changfeng to Duoping	Rebuild	15.598	6.5	Asphalt
10	Dejiang County	Fengjia Zhai to Zhayu	Rebuild	9.812	5.5	Cement
11	Dejiang County	Qiaotou to Yanjin	Rebuild	8.353	5.5	Cement
12	Dejiang County	Banzhu Yuan to Hepeng	Rebuild	8.975	6.5	Asphalt
13	Dejiang County	Baiguo Tuo to Longqiao	Rebuild	17.143	5.5	Cement
14	Dejiang County	Wenping to Yinsi	Rebuild	10.080	5.5	Cement
15	Dejiang County	Zhangxin Jie to Yanmen	Rebuild	3.746	5.5	Cement
16	Dejiang County	Weigang Zui to Gonghe	Rebuild	3.960	5.5	Cement
17	Dejiang County	Xinchang to Changxian	Rebuild	7.791	4.5	Cement
18	Dejiang County	Meizi to Hua Yuanzi	Rebuild	6.108	5.5	Cement
19	Dejiang County	Hetou to Dayuan	Rebuild	19.005	5.5	Cement
20	Dejiang County	Xiaba to Yalao Shan	Rebuild	6.073	5.5	Cement
21	Dejiang County	Laozhai to Daba Tou	Rebuild	2.537	5.5	Cement

22	Dejiang County	Sanceng Yan to Anshan	Rebuild	4.680	4.5	Cement
23	Dejiang County	Changba to Xintan	Rebuild	5.943	6.5	Asphalt
24	Dejiang County	Shenxi Yakou to Huangtu	Rebuild	3.018	4.5	Cement
25	Dejiang County	Chazi Shan to Fenghuang	Rebuild	5.288	4.5	Cement
26	Dejiang County	Dejiang to Luqing	Rebuild	26.450	6.5	Asphalt
27	Dejiang County	Gonghe Qiaotou to Huanlian Gai	Rebuild	2.890	4.5	Cement
28	Dejiang County	Yuzhong Chang to Daping	Rebuild	3.335	4.5	Cement
29	Dejiang County	Dingjia Shan to Wotuo	Rebuild	3.990	4.5	Cement
30	Dejiang County	Fengxi to Tongwan	Rebuild	7.567	4.5	Cement
31	Dejiang County	Laoshui Xi to Guanzhuang	Rebuild	2.781	4.5	Cement
32	Dejiang County	Nanzhu Gou to Dengjia	Rebuild	2.623	4.5	Cement
33	Dejiang County	Xinzhai to Zaoni Xi	Rebuild	1.516	4.5	Cement
34	Dejiang County	Dashu Wan to Jiantai	Rebuild	8.271	4.5	Cement
35	Dejiang County	Huoyan Tu to Zaojiao Dou	Rebuild	4.806	4.5	Cement
36	Dejiang County	Huangjia to Huangba Sanzu	Rebuild	3.180	4.5	Cement
37	Dejiang County	Kedian to Tianxing Qiao	Rebuild	5.480	4.5	Cement
38	Dejiang County	Shaxi Yakou to Datu Wan	Rebuild	5.923	4.5	Cement
39	Dejiang County	Longzhai to Ranjia Wan	Rebuild	10.728	4.5	Cement
40	Dejiang County	Township Government to Pengjia Zhai	Rebuild	3.550	4.5	Cement
41	Dejiang County	Shashu Ba to Taowan	Rebuild	2.207	4.5	Cement
42	Dejiang County	Hedui Men to Xintang	Rebuild	2.208	4.5	Cement
43	Dejiang County	Chaodi to Chenyuan	Rebuild	7.190	4.5	Cement
44	Dejiang County	Wujia Gou to Xujia Shan	Rebuild	3.618	4.5	Cement
45	Dejiang County	Changtan to Yuanchang	Rebuild	3.743	4.5	Cement

46	Dejiang County	Xiaba to Xintan	Rebuild	7.523	4.5	Cement
47	Dejiang County	Xiajie to Shangchang Gou	Rebuild	3.439	4.5	Cement
48	Dejiang County	Mati Xi to Meijia	Rebuild	4.706	4.5	Cement
49	Dejiang County	Lizi Tan to Huangjia	Rebuild	3.943	4.5	Cement
50	Dejiang County	Lizi Shui to Chenjia	Rebuild	2.000	4.5	Cement
51	Dejiang County	Mati Xi to Guanlin	Rebuild	3.616	4.5	Cement
52	Dejiang County	Zhoujia to Huangba Yan	Rebuild	4.034	4.5	Cement
53	Dejiang County	Tujia to Zhuangyan	Rebuild	6.235	4.5	Cement
54	Dejiang County	Real State Board to Xiaogou	Rebuild	1.314	4.5	Cement
55	Dejiang County	Huangba Wanxiao to Tanba	Rebuild	3.413	4.5	Cement
56	Dejiang County	Ganxi Qiaotou to Aojia	Rebuild	6.458	4.5	Cement
57	Dejiang County	Dahe to Longxi	Rebuild	4.303	4.5	Cement
58	Dejiang County	Fenglin to Qingqiu Shu	Rebuild	3.341	4.5	Cement
59	Dejiang County	Yanshang to Kuangshan	Rebuild	8.44	4.5	Cement
60	Sinan County	Wenwen to Tunshan	Rebuild	7.646	4.5	Cement
61	Sinan County	Paotong Shu to Dawan	Rebuild	13.330	4.5	Cement
62	Sinan County	Wenxi to Sanxing	Rebuild	12.988	6.5	Cement
63	Sinan County	Wensan Road to Lianmeng	Rebuild	12.352	4.5	Cement
64	Sinan County	Zaozi Ping to Huangni Tian	Rebuild	5.736	4.5	Cement
65	Sinan County	Wenxi Town Government to Changzheng	Rebuild	13.297	4.5	Cement
66	Sinan County	Sanxing to Shangba	Rebuild	8.276	4.5	Cement
67	Sinan County	Wensan Road to Tangjia Ba	Rebuild	4.851	4.5	Cement
68	Sinan County	Yanmen Kou to Sanxing	Rebuild	8.942	4.5	Cement
69	Sinan County	Tangben Road to Antang	Rebuild	7.574	4.5	Cement

70	Sinan County	Aijia Shan to Xinming	Rebuild	9.625	4.5	Cement
71	Sinan County	Yongxing to Machi	Rebuild	7.297	4.5	Cement
72	Sinan County	Tangben Road to Shuanghe	Rebuild	14.470	4.5	Cement
73	Sinan County	Donghua Xiang to Donggua Xi	Rebuild	6.605	4.5	Cement
74	Sinan County	Zhangting Road to Liangtian	Rebuild	8.078	4.5	Cement
75	Sinan County	Zhangting Road to Baowei	Rebuild	4.555	4.5	Cement
76	Sinan County	Baiyang Ping to Nanshan	Rebuild	3.175	4.5	Cement
77	Sinan County	Lancao Cha to Meizi Bao	Rebuild	3.974	4.5	Cement
78	Sinan County	Longshui to Chaxi	Rebuild	14.320	4.5	Cement
79	Sinan County	Shangguan Qing to Langan	Rebuild	8.411	4.5	Cement
80	Sinan County	Zhangting Road to Jingang	Rebuild	6.816	4.5	Cement
81	Sinan County	Lianghui Jin to Guankou	Rebuild	11.997	6.5	Cement
82	Sinan County	Nixi to Ca’er	Rebuild	9.728	5.5	Cement
83	Sinan County	Pujia Gou to Dashan	Rebuild	2.226	4.5	Cement
84	Sinan County	Dongqing Ao to Dongjia Wan	Rebuild	11.563	4.5	Cement
85	Sinan County	Qinglong Zui to Zhugua Xi	Rebuild	6.845	4.5	Cement
86	Sinan County	Liangtian to Shanxing	Rebuild	6.040	4.5	Cement
Total				**646.422**		

Table 2.1-2 Bridge list

Serial No.	County/ District	Bridge name	Type of construction	Scale of construction		Bridge type layout	Bridge located route	Bridge crossed river
				Length (m)	Width (m)			
1	Dejiang County	Lengshui Jie bridge	New construction	73	7.0	4-16m hollow slab	Changfeng to Duoping	Yangshan river
2	Dejiang County	Jiangjiagou bridge	New constru	42.5	5.5	2-16m hollow	Xinchang to	Jiangjiagou

Serial No.	County/ District	Bridge name	Type of construction	Scale of construction		Bridge type layout	Bridge located route	Bridge crossed river
				Length (m)	Width (m)			
			ction			slab	Changxian	xiaogou liuchi river branch
3	Dejiang County	Fengjiazhai bridge	New construction	15	7.5	1-10m hollow slab	Fengjiazhai to Zhayu	Fengjiazhai Xiaohe Mati river branch
4	Dejiang County	Chuanqian bridge	New construction	36	5.5	2-13m hollow slab	Bajiaoxi to Shiban	Shengji river Yangshan river branch
5	Dejiang County	Huangnidui bridge	New construction	24	5.5	1-16m hollow slab	Qishugou to Hengshiliang	Hengshiliang brook Wujiang river branch
6	Dejiang County	Pianyan bridge	New construction	22	6.5	1-16m hollow slab	Pianyanjie to Shibanxi	Pianyan river Liuchi river branch
7	Dejiang County	Xianlong bridge	New construction	36	5.5	2-13m hollow slab		Nangan river Fengle river branch
8	Dejiang County	Guanyinyan bridge	New construction	41	5.5	2-16m hollow slab	Guanyinyan to Xinlongpo	Pianyan river Liuchi river branch
9	Dejiang County	Tianba bridge	New construction	23	5.5	1-16m hollow slab		Mati river branch
10	Dejiang County	Shenxi bridge	New construction	28	5.5	1-16m hollow slab	Xiaba to Shenxi	Nangan river Fengle river branch
11	Dejiang County	Yanjin bridge	New construction	18	7.5	1-10m hollow slab	Qiaotou to Yanjin	Hengshiliang brook Wujiang river branch

Serial No.	County/ District	Bridge name	Type of construction	Scale of construction		Bridge type layout	Bridge located route	Bridge crossed river
				Length (m)	Width (m)			
12	Dejiang County	Xiaoxigou bridge	New construction	15	5.5	1-6m hollow slab	Zhoujia to Huangbayan	Xiaoxigou Liuchi river branch
13	Dejiang County	Tanjiashan bridge	New construction	20	5.5	1-10m hollow slab		Tanjia river Mati river branch
14	Dejiang County	Xinlong bridge	New construction	33	5.5	2-13m hollow slab		Pianyan river Liuchi river branch
15	Dejiang County	Dongmenqian bridge	New construction	34	5.5	2-13m hollow slab	Baiyan to Dongmenqian	Dongmenqian river Yangshan river branch
16	Dejiang County	Hengshiliang bridge	New construction	24	5.5	1-16m hollow slab	Qishugou to Hengshiliang	Hengshiliang brook Wujiang river branch
17	Dejiang County	Zhongxi bridge	New construction	34	5.5	2-13m hollow slab	Gaoshan to Zhonghe	Zhongxigou Yangshan river branch
18	Dejiang County	Dashuituo bridge	New construction	21	5.5	1-13m hollow slab	Gaoshan to Zhonghe	Zhongxigou Yangshan river branch
19	Sinan County	Tangjiaba bridge	New construction	18.0	5.5	1-13m hollow slab	Wensan Road to Tangjiaba	Heitan river Wujiang river branch
20	Sinan County	Kongjiahe bridge	New construction	29.0	5.5	1-13m hollow slab	Wenxi Town government to Changzheng	Kongjia river Heitan river branch
21	Sinan County	Juanziwan bridge	New constru	26.0	5.5	1-16m hollow	Lancaocha to	Gangou

Serial No.	County/ District	Bridge name	Type of construction	Scale of construction		Bridge type layout	Bridge located route	Bridge crossed river
				Length (m)	Width (m)			
			ction			slab	Meizibao	
22	Sinan County	Meizibao bridge	New construction	30.0	5.5	2-13m hollow slab	Baiyangping to Nanshan	Meizibao river Qingdu river branch
23	Sinan County	Yandixia bridge	New construction	18.0	5.5	1-13m hollow slab	Baiyangping to Nanshan	Meizibao river Qingdu river branch
24	Sinan County	Mayangdong bridge	New construction	14.0	5.5	1-8m hollow slab	Pujiagou to Dashan	cross Zhnagjiapo brook and into He'e brook
25	Sinan County	Qinglongjiu bridge	New construction	40	7.0	1-30m ferroconcrete box girder	Sishi road to Shuidong	Xiaoxi river Longdijiang river branch
26	Sinan County	Guihua bridge	New construction	23	7.0	1-13m hollow slab	Guihuashu to Guihua	Dabachang river Longdijiang River branch
27	Sinan County	Danianfang bridge	New construction	23	7.0	1-13m hollow slab	Guihuashu to Guihua	Dabachang river Longdijiang River branch
28	Sinan County	Yuanjiahao bridge	New construction	26	7.0	1-16m hollow slab	Shuijinwan to Sitang Town	Yuanjiahao xiaohe Wu river branch
29	Sinan County	Sanchatang bridge	New construction	35	7.0	2-13m hollow slab	Shanggongqing to Langan	Yangjiaao river Liuchi river branch
30	Sinan County	Sanxing bridge	New construction	16	7.0	1-8m hollow slab	Wenxi to Sanxing	Kongjia river Heitan river

Serial No.	County/ District	Bridge name	Type of construction	Scale of construction		Bridge type layout	Bridge located route	Bridge crossed river
				Length (m)	Width (m)			
								branch

2.2 Recommended Route O-D and Major Control Point of the Trend

Each road is named with O-D villages and towns, and the O-D and the trend control points of the recommended project are listed in 2.2-1, 2.1-1 and 2.1-2 respectively.

Table 2.2-1 Administrative Geographical Location of All Subprojects

Dejiang County			
Serial No.	**Project name**	**O-D**	**Towns and villages involved**
1	Mingxi-Dongquan	Yanpen-Dongquan	Fuxing Town, Baopen Village, Nanxi Village, Gonghe Village and Dongquan Village
2	Jiancha-Shaxi	Gaozhu-Shaxi	Jiancha Town, Shaxi Town, Gaozhu Village, Songxi Village, Gunping Village, Jiancha Community, Wanba Community, Kongshan Village(Longquan Town：Tangba Village, Taoyuan Village, Naoshui Village)
3	Hepeng-Longxi	Hepeng-Longxi	Yantang Town, Hexing Town, Hepeng Village, Daxing Village, Niaoping Village, Longxi Village, Qinglonggang Village, Chayuan Village, Banping Village
4	Qin Jiawan-Chaodi	Qin Jiawan-Chaodi	Chaodi Town, Shangping Village, Tangba Village, Qinggangbao Village
5	Changba-Wangpai	Changba-Wangpai	Tongjing Town, Tongxin Community, Liming Village, Bajiao Village, Jinchao Village,
6	Pingyuan-Nangan	Pingyuan-Nangan	NanganTown, Dalong Village, Xinglong Village, Huoshi Village, Jinpen Village, Loufang Village，Pingyuan Town：Sihe Village
7	Datu-Huangba	Datu-Huangba	Shaxi Town, Longba Village
8	Jiancha-Dahe	Jiancha-Dahe	Jiancha Town, Dahe Village, Jiancha Community
9	Changfeng-Duoping	Changfeng-Duoping	Changfeng Town, Xianjin Village, Tongba Village, Nongchen Village, Zhongzhuang Village, Duoping Village, Changfeng Village
10	Fengjiazhai-Zhayu	Fengjiazhai-Zhayu	Wenping Town,Jingjiao Town, Wenping Community, Tuodi Village, Sanjiao Village, Tongxin Village, Zhayu Village
11	Qiaotou-Yanjing	Qiaotou-Yanjing	Gonghe Town, Jieshang Village, Yanjing Village
12	Banzhuyuan-Hepeng	Banzhuyuan-Hepeng	Yantang Town, Shuiping Community, Xianfeng Village，Hexing Town：Hepeng Village,

			Dongyuan Village, Baiguo Village
13	Baiguotuo-Longqiao	Baiguotuo-Longqiao	Changbao Town, Changbao Community, Dazhaitou Village, Shangbao Village, Sanjiao Village
14	Wenping-Yinsi	Wenping-Yinsi	Wenping Town, Tiekeng Village, Fengxiang Village
15	Zhangxinjie-Yanmen	Zhangxinjie-Yanmen	Chaodi Town, Shangping Village
16	Weigangzui-Gonghe	Weigangzui-Gonghe	GongheTown, Xinchun Village
17	Xinchang-Changxian	Xinchang-Chagnxian	Hexing Town,Changxian Village,Dongyuan Village，Jiancha Town：Jiancha Village
18	Meizi-Huayuanzi	Meizi-Huayuanzi	Fuxing Town, Jia Village,Meizi Village
19	Hetou-Dayuan	Hetou-Dayuan	Quankou Town, Mala Village, Xinba Village,Xinlian Village, Zhuchang Village
20	Xiaba-Yalaoshan	Xiaba-Yalaoshan	Jiancha Town, Longpan Village
21	Laozhai-Dabatou	Laozhai-Dabatou	Hexing Town,Banping Village
22	Sancengyan-Anshan	Sancengyan-Anshan	Longquan Town,Anshan Village
23	Changba-Xintan	Changba-Xintan	Wenping Town, Yuzhu Village,Gaojing Village, Changba Village,Wujiang Village
24	Shenxiya-Huangtu	Shenxiya-Huangtu	Wenping Town,Huayuan Village, Changxing Village
25	Chazishan-Fenghuan	Chazishan-Fenghuan	Tongjing Town,Qingyuan Village,Jinpen Village,Qilixi,Fenghuan Village
26	Dejiang-Xiaqing	Dejiang-Xiaqing	Yantang Town,Shuiping Community,Xianfeng Village,Xin Village,Qingshuitang Village,Luqing Village，Hexing Town：Baiguo Village
27	Gongheqiaotoup-Hualiangai	Gongheqiaotoup-Hualiangai	Gonghe Town,Heping Village
28	Yuzhongchang-Daping	Yuzhongchang-Daping	Yantang Town,Shanshuba Village,Qilixi Village
29	Dingjiashan-Chawotuo	Dingjiashan-Chawotuo	Yantang Town,Gaojiawan Village, Chawotuo Village
30	Fengxi-Tongwan	Fengxi-Tongwan	Fengxiangxi Town,Fengpu Village,Tongwan Village
31	Laoshuixi-Guanzhuang	Laoshuixi-Guanzhuang	HexingTown,Zhongzhai Village
32	Nanzhugou-Dengjia	Nanzhugou-Dengjia	Jiancha Town, Dengjia Village
33	Xinzhai-Zhainixi	Xinzhai-Zhainixi	Qianjia Town, Xinzhai Village
34	Dashuwan-Jiantai	Dashuwan-Jiantai	Jiancha Town,Jiantai Village, Gaozhu Village

35	Huoyantu-Zhaijiaodou	Huoyantu-Zhaijiaodou	Jiancha Town,Chaoxi Village,Gaozhu Village
36	Huangjia-Huangbasanzu	Huangjia-Huangbasanzu	Shaxi Town, Huangba Village
37	Kedian-Tianxinggqiao	Kedian-Tianxingqiao	Fuxing Town, KedianVillage, Nanmu Village
38	Shaxiyakou-Datuwan	Shaxiyakou-Datuwan	Nangan Town,Datuwan Village
39	Longzhai-Ranjiawan	Longzhai-Ranjiawan	Nangan Town,Long Zhai Village,Changyuan Village
40	Township Government-Pengjiazhai	Township Government-Pengjiazhai	Changfeng Town, Xianjin Village
41	Shanshuba-Taowan	Shanshuba-Taowan	Yantang Town, Shanshuba Village
42	Heduimen-Xintang	Heduimen-Xintang	Quankou Town, Xintang Village
43	Chaodi-Chenyuan	Chaodi-Chenyuan	Chaodi Town, Tengxi Village, Chenyuan Village,Chaodi Village
44	Wujiagou-Xujiashan	Wujiagou-Xujiashan	Jiancha Town, Zhonghua Village
45	Changtan-Yuanchang	Changtan-Yuanchang	Fengxiangxi Town, Yuanchang Village, Xinjie Village
46	Xiaping-Xintan	Xiaping-Xintan	Tongjing Town, Xiaping Village, Xintan Village
47	Xiajie-Shangchanggou	Xiajie-Shangchanggou	Qingshuitang Village
48	Matixi-Meijia	Matixi-Meijia	Meijia Village
49	Lizitan-Huangjia	Lizitan-Huangjia	Xinkeng Village
50	Lizishui-Chenjia	Lizishui-Chenjia	Lianhe Village
51	Matixi-Guanlin	Matixi-Guanlin	Guanlin Village
52	Zhoujia-Huangbayan	Zhoujia-Huangbayan	Xiaoxi Village, Dahe Village
53	Tujia-Zhuangyan	Tujia-Zhuangyan	Zhuangyan Village, Zhaishang Village,Xisha Village
54	Fangchanju-Xiaogou	Fangchanju-Xiaogou	Qiaotou Community
55	Huangbayuan-Xiaoqinba	Huangbayuan-Xiaoqinba	Qinba Village
56	Ganxiqiaotou-Aojia	Ganxiqiaotou-Aojia	Ganxiqiaotou
57	Dahe-Longxi	Dahe-Longxi	（Hexing Town：Longxi Village），（Jiancha Town：Dahe Village）
58	Fenglin-Qingqiushu	Fenglin-Qingqiushu	Qingqiushu Village
59	Yanshang-Kuangshan	Yanshang-Kuangshan	Dayuan Village

	Sinan County		
Serial No.	**Project name**	**O-D**	**Towns and villages involved**
60	Wengshan-Tunshan	Yangchalu-Hejiaju	Wenjiadian Town,Tunshan Village
61	Paotongshu-Dawan	Paotongshu –Zhangjiaaotian	Wenjiadian Town,Qunshan Village,Hongqi Village
62	Wengxi-Sanxing	Fanjiaping-Sanxing Village	Wengxi Town,Sanxing Village,Wenxi Community,Changzheng Village,Caoba Village,Datang Village,Fujiazhai Village,Tangjiaba Village
63	Wengsan Road-Lianmeng	Tangjiaba-Lianmeng	Wengxi Town,Lianmeng Village
64	Zaoziping-Huangnitiao	Changjing-Red Army Bridge	Wengxi Town, Changzheng Village,Shengli Village
65	Wenxi Township Government-Changzheng	Liangfengdong-Shangbatian	Wengxi Town, Changzheng Village, Minshan Village
66	Sanxing-Shangba	Sanxing Village jieshang-Shangbatiao Village jieshang	Wenxi Town,Sanxing Village,Shangbatian Village
67	Wengsan Road-Tangjiaba	Tangjiaba-Luanshan	Wenxi Town, Tangjiaba Village
68	Yanmenkou-Sanxing	Sanxing Village jieshang-Dazhai	Wengxi Town, Sanxing Village
69	Tangben Road-Antang	Shikan-Yangliutang	Wengxi Town, Antang Village
70	Aijiashan-Xinming	Zaogutian-Lishan’gou	Sandaoshui Town,Xinmin Village, Boyang Village, Hongxi Village, Zhouzhai Village
71	Yongxin-Machi	Yuanjiasi-Sanwan	Sandaoshui Town, Shuanghe Village,Boyang Village, Hongxi Village
72	Tangben Road-Shuanghe	Boyangdaqiao-Changxin	Sandaoshui Town, Xintang Village, Yongxing Village
73	Donghua Town-Dongguaxi	Xuetangbao-Taxi	Donghua Town, Taxi Village
74	Zhangting Road-Liangtian	Fenbao-Luojiaping	Kuanping Town, Liangjiaba Village
75	Zhangting Road-Baowei	Xiangjiawan Primary School-Dongguaxi Village committee	Kuanping Town, Donghua Town, Baowei Village, Qiaoyan Village, Qianjin Village,Longjiang Village, Dongguanxi Village
76	Baiyangping-Nanshan	Baiyangping-Nanshan	Tiaoqiao Town, Nanshan Village
77	Lancaocha-Mei	Lancaocha-Meizib	Tianqiao Town, Meizibao Village

	zibao	ao	
78	Longshui-Chaxi	Zhangjiapo-Huoshiya	Qinggangpo Town, TianzhuangVillage
79	Shangguanqing-Langan	Guanqingwan-Shengjiping	Yangjiaao Town, Wangdaping Village, NanganVillage, Guantianba,Tujing Village
80	Zhangting Road-Jinggang	Xiangshutian-Shipenya	Zhangjiazhai Town, Jinggang Village, Changsha Village, Zhongshan Village
81	Lingshuijing-Guankou	Daqiaogou-Chemical plant	Sitang Town, Guankouchang, Yuejiazhai, Zhangjiashan, Jianjiaao
82	Nixi-Caer	Dayakou-Youmushui	Daheba Town, Dayuanzi, Qianjian Village, Yanfeng Village, Tianba, Tiaoziyan, Shuang'an
83	Pujiagou-Dashan	Pujiagou-Dashandong	Daheba Town, Majiashan, Ma'an, Datuo,Qunxing,Sijiao
84	Dongqingao-Dongjiawan	Xijia'ao-Yangqueyan Dock	HepengxiTown,Liangshuiqing Village
85	Qinglongzui-Zhuguaxi	Qinglongzui-Dapo	Silin Town, Zhongling Village, Ganchangba, Fenglian Village, Wenjiapo, Sijiao Village
86	Liangtian-Shanxing	Daqiaogou-Chemical plant	Sitang Town, Shanxing Village

2.3 Major Technical Standards

2.3.1 Technical standard for rural highway

The following standards, including Technical Standard of Highway Engineering (JTHGB01-2003), Rural Highway Construction Standard Guidance and Technical Standard of Rural Highway in Guizhou published by Ministry of Communications shall be followed. Major importance shall be attached to Technical Standard of Highway Engineering (JTHGB01-2003) while partial difficult section shall abide by the Technical Standard of Rural Highway in Guizhou and "Four requirements for the infrastructure of beautiful villages-well-off road in Guizhou Province".

1. Highway classification: Level Four
2. Design speed: 20km/h
3. Width of roadbed: 6.5m (two-lane), 4.5m (single lane), 5.5m (single lane)

4. Load: Highway-Ⅱ

5. Design life: level four asphalt concrete pavement (6 years), level four asphalt concrete pavement(10 years)

6. Roadway width: 2×3.0m (6.5m roadbed), 1×3.5m (4.5m roadbed), 1×4.5m(5.5m roadbed).

7. Road camber design grade: 2.0% Standard shall be adopted for cross slope in view of the great local rainfall.

6.5m(two-lane): two-sided slope shall be adopted; road cross slope 2.0% and road shoulder cross slope 2.0% shall be employed

5.5m, 4.5m (single lane): one side slope shall be employed while the cross slope of roadway shall be 2.0%.

8. Earthquake resistant design Standard: according to Seismic Intensity Block Plan in Guizhou Province，seismic basic intensity shall be level six fortification, acceleration magnitude of seismic oscillation peak is 0.05g, and significance correction factor is 1.3.

2.3.2 Technical standard for bridge and culvert

Design load is highway Ⅱ

Design flood frequency: 1/100 for large and middle sized bridge; 1/25 for small bridge, culvert and small sized drainage structure.

For the key technical indexes, please see Table 2.3-1.

Table 2.3-1 Major technical standards

Serial No.	Item	Unit	technical index (specified value)	technical index (adopted value)	Remark
1	highway classification		Level four	Level four	
2	design speed	km/h	20	20	
3	roadbed width	m	6.5/4.5	6.5/5.5/4.5	
4	Width of traffic lane	m	6.0/3.5	5.5/4.5/3.5	
5	General minimum radius for horizontal curve	m	30	30	
6	Extreme minimum radius for horizontal curve	m	15	12	For difficult sections, “Beautiful Village”standard shall be adopted
7	maximum longitudinal grade	%	9	12	
8	Mimimum slope length	m	60	60	
9	minimum radius for crest vertical curve	m	200	200	
10	minimum radius for concave vertical	m	200	200	

Serial No.	Item	Unit	technical index (specified value)	technical index (adopted value)	Remark
	curve				
11	motor vehicle loading		Highway-Ⅱ	Highway-Ⅱ	
12	pavement structure			bituminous concrete/ cement concrete	
13	Bridge width	m		7.0/7.5	
14	medium bridge design flood frequency		1/100	1/100	
	Small bridge design flood frequency		1/25	1/25	
15	roadbed design flood frequency		1/25	1/25	

2.4 Estimated Traffic Flow

According to the prediction of vehicle ownership, the amount will experience gradual rise while the traveling volume is also increasing therewith. The annual transportation volume after the construction of rural highway is shown in table 2.4-1.

Table 2.4-1 Prediction of the transportation volume for vision project on planned phases (Unit：pcu/d)

Serial No.	Highway name	Highway location	Planned year			
			2020	2025	2030	2034
1	Mingxi-Dongquan	Dejiang County	419	529	624	672
2	Jiancha-Shaxi	Dejiang County	400	499	584	627
3	Hepeng-Longxi	Dejiang County	413	525	624	676
4	Qinjianwan-Chaodi	Dejiang County	416	518	605	649
5	Changba-Wangpai	Dejiang County	409	524	624	673
6	Pingyuan-Nangan	Dejiang County	448	581	698	759
7	Datu-Huangba	Dejiang County	388	490	578	622
8	Jiancha-Dahe	Dejiang County	402	508	601	649

9	Changfeng-Duoping	Dejiang County	413	531	634	688
10	Fengjiazhai-Zhayu	Dejiang County	218	273	320	344
11	Qiaotou-Yanjing	Dejiang County	214	264	306	327
12	Banzhuyuan-Hepeng	Dejiang County	404	504	589	628
13	Baiguotuo-Longqiao	Dejiang County	309	384	450	483
14	Wenping-Yinsi	Dejiang County	340	430	509	550
15	Zhangxinjie-Yanmen	Dejiang County	310	385	449	478
16	Weigangzui-Gonghe	Dejiang County	321	393	454	486
17	Xinchang-Changxian	Dejiang County	217	273	321	343
18	Meizi-Huayuanzi	Dejiang County	337	431	513	557
19	Hetou-Dayuan	Dejiang County	287	352	408	436
20	Xiaba-Yalaoshan	Dejiang County	308	382	448	484
21	Laozhai-Dabatou	Dejiang County	329	418	497	542
22	Sancengyan-Anshan	Dejiang County	203	257	302	324
23	Changba-Xintan	Dejiang County	424	543	647	702
24	Shanxiyakou-Huangtu	Dejiang County	218	280	334	364
25	Chazishan-Fenghuang	Dejiang County	221	286	343	369
26	Dejiang-Luqing	Dejiang County	426	540	639	689
27	Gongheqiaotou-Huanlian’gai	Dejiang County	231	298	357	389
28	Yuzhongchang-Daping	Dejiang County	222	290	350	383
29	Dingjiashan-Chatuowo	Dejiang County	210	272	326	352
30	Fengxi-Tongwan	Dejiang County	220	289	351	385
31	Laoshuixi-Guanzhuang	Dejiang County	209	270	322	348
32	Nanzhugou-Dengjia	Dejiang County	198	253	300	323
33	Xinzhai-Zaonixi	Dejiang County	199	256	306	331

34	Dashuwan-Jiantai	Dejiang County	218	278	331	358
35	Huoyantu-Zaojiaodou	Dejiang County	216	279	333	361
36	Huangjia-Huangbasanzu	Dejiang County	219	288	349	380
37	Kedian-Tianxing Bridge	Dejiang County	235	312	379	415
38	Shaxiyakou-Datuwan	Dejiang County	224	290	348	377
39	Longzhai-Ranjiawan	Dejiang County	222	282	335	363
40	Township Government-Pengjiazhai	Dejiang County	213	276	331	358
41	Shanshuba-Taowan	Dejiang County	215	280	336	363
42	Heduimen-Xintang	Dejiang County	216	287	351	389
43	Chaodi-Chenyuan	Dejiang County	225	293	352	381
44	Wujiagou-Xujiashan	Dejiang County	223	298	363	397
45	Changtan-Yuanchang	Dejiang County	217	282	338	364
46	Xiaping-Xintan	Dejiang County	235	311	379	416
47	Xiajie-Shangchanggou	Dejiang County	214	278	333	361
48	Matixi-Meijia	Dejiang County	229	306	374	411
49	Lizitan-Huangjia	Dejiang County	222	294	355	385
50	Lizishui-Chenjia	Dejiang County	215	289	352	381
51	Matixi-Guanlin	Dejiang County	214	277	333	362
52	Zhoujia-Huangbayan	Dejiang County	228	301	364	394
53	Tujia-Zhuangyan	Dejiang County	228	300	365	400
54	Real Estate Board-Xiaogou	Dejiang County	228	308	378	414
55	Huangbayuan-Xiaoqinba	Dejiang County	221	288	347	377
56	Ganxiqiaotou-Aojia	Dejiang County	228	301	366	402
57	Dahe-Longxi	Dejiang County	241	316	382	416
58	Fenglin-Qingqiushu	Dejiang County	243	321	390	426

59	Yanshang-Kuangshanchang	Dejiang County	230	300	362	395
60	Wengshan-Tunshan	Sinan County	260	352	433	475
61	Paotongshu-Dawan	Sinan County	242	313	375	407
62	Wengxi-Sanxing	Sinan County	456	591	710	774
63	Wengsan Highway-Lianmeng	Sinan County	265	360	444	486
64	Zaoziping-Huangnitian	Sinan County	251	339	416	456
65	Wenxi Township government-Changzheng	Sinan County	222	289	347	375
66	Sanxing-Shangba	Sinan County	218	275	325	349
67	Wensan Highway-Tangjiaba	Sinan County	214	276	331	362
68	Yanmenkou-Sanxing	Sinan County	243	323	393	428
69	Tangben Highway-Antang	Sinan County	247	332	406	444
70	Aijiashan-Xinming	Sinan County	246	325	395	431
71	Yongxin-Machi	Sinan County	240	319	387	418
72	Tangben Highway-Shuanghe	Sinan County	276	374	462	510
73	Donghua Town-Dongguaxi	Sinan County	231	304	369	405
74	Zhangting Highway-Liangtian	Sinan County	239	317	386	423
75	Zhangting Highway-Baowei	Sinan County	216	280	335	363
76	Baiyangping-Nanshan	Sinan County	243	319	386	419
77	Lancaocha-Meizibao	Sinan County	239	321	392	428
78	Longshui-Chaxi	Sinan County	271	366	451	495
79	Shangguanqing-Langan	Sinan County	234	314	386	426
80	Zhangting Highway-Jinggang	Sinan County	236	312	380	416
81	Liangshuijing-Guankou	Sinan County	415	528	628	682
82	Nixi-Caer	Sinan County	347	456	551	601
83	Pujiagou-Dashan	Sinan County	218	284	341	370
84	Dongqing'ao-Dongjiawan	Sinan County	238	312	377	411
85	Qinglongzui-Zhuguaxi	Sinan County	243	327	402	443
86	Liangtian-Shanxing	Sinan County	236	312	379	414

2.5 Road Status and Major Problems for Villages of This Project

1. Road project status in villages

There are 86 roads across village in this project. Through field investigation, the overall situation of all roads can be summarized as follows:

(1) The routine index is relatively low with the minimum radius of horizontal curve of 10m. Moreover, there are many horizontal curves for the whole road and

some large longitudinal slopes.

(2) Most roads are paved with macadam without pavement. Without pavement structure and maintenance for a long time, the roads are pitted with holes, and there are many vehicle tracks and heaps.

(3) The basic roadbed width is 2.5-5m. Most roads have no safety protection facilities and only a few fill subgrades have been equipped with shoulder walls. Therefore, the roadbed sink is serious. As no protection facilities are set at the excavated roadbed slopes, the rocky slope rate is generally 1:0.25-1:0.5, and the soil slope rate is 1:0.75-1:1. Most roads are relatively stable except that several sections with weak stability may be in risk of crash.

(4) Most of the side ditches are damaged and deformed, which causes severe block and the rainwater erodes the pavement directly. Most of the original culverts are damaged to various degrees, which causes severe siltation and water drainage failure. The pore diameter of culvert is small, and the construction quality is poor. Cracks occur on the culvert and culvert platform.

(5) Safety facilities; There is hardly any safety facilities on the original road. Potential safety risk exists in part of the road, for example, the long downhill combining sharp-radius curve and so on.

(6) Many sections of side slopes are not processed, and problems like collapse and debris flow occur after all year round rainwash. Some part of collapse affects the traffic safety severely.

2. Major existing problems

(1) Pavement conditions: Due to ineffective supervision, the road is rolled by overload trucks for ages. Besides, the maintenance is not timely and this leads to severe water damage to the pavement. Most road sections are already eroded to the basement layer. Large tract of stones, hollows, cracks and breakages occur.

(2) Roadbed conditions: The roadbed water damage is serious and the under waling collapses, which reduces the stability greatly. Besides, no maintenance is done for a long time and this causes difference of the roadbed width and severe roadbed subsidence. The side slope is eroded and weathered by rainwater, and with

no waling structure. Collapse is serious especially in rainy days.

(3) Bridge, culvert and side ditch conditions: As no clean work is performed for a long time, the side ditch is deformed and blocked severely, which leads to the failure of drainage. This results in direct rainwater erosion to the pavement and further erosion to the roadbed. Thus the road is in vicious circle. There are a few culverts and the width is narrower than the planned road. So it needs to be rebuilt.

(4) Safety facilities conditions: Most of the road sections have no traffic markings. The existing minority signs are damaged too. There is no safety anti-collision facility in some part of fill sections and the existing facility is aged severely.

(5) Side slope conditions: There exist collapse, fluxion, dump and slide. The surface rock masses of collapse side slope are eroded by weathering and mine vibration of blasting, rolling down along the slope and stacking at the slope base. They stack into fragment piles in nature state. Debris flow also takes place frequently. Most road sections have no side slope protection measure, and the safety condition is worrying.

There is attached figure 2.5-1 for the village road current situation in planned project area, and current situation photos of part of the village road are provided.

Figure2.5-1 Status of some current village roads

2.6 Major work amount

Major projects for the planned road: village road of 646.422km, 30 bridges of 838m, culvert of 12714.8/1976 m/road, 302 grade intersections, earth and rock engineering excavation of 5.8778 million m^3, protection and drainage engineering of 646.422km and special roadbed processing of 46.32km. For the major work amount of this project, please refer to the below table 2.6-1.

Table 2.6-1 Major work amount of this planned construction project

Serial No.	Project Name	Unit	Work amount		
			Dejiang County	Sinan County	Total
1	Village road	item	59	27	86
		km	415.705	230.717	646.422
2	Bridge engineering	m/set	539.5/18	298.5/120	838/30
(1)	Small bridge engineering	m/set	210 / 10	213 / 10	423 / 20
(2)	Medium bridge engineering	m/set	330 / 8	85 / 2	415 / 10
3	Roadbed engineering	km	415.705	230.717	646.422
(1)	Excavation amount	10,000m^3	341.58	246.19	587.78
(2)	Fill amount	10,000m^3	114.08	62.70	176.78
(3)	Utilization amount	10,000m^3	79.02	59.92	138.94
(4)	Borrowing amount	10,000m^3	3.81	0	3.81
(5)	Discard amount	10,000m^3	218.31	183.12	401.43
(6)	Special roadbed processing	km	29.40	16.92	46.32
(7)	Drainage project	km	415.706	230.717	646.422
(8)	Protection and reinforcement project	km	415.706	230.717	646.422
(1)	General roadbed protection and reinforcement	m^3	397621	163758.9	561379.9
4	Pavement engineering	km	415.706	230.717	646.422
(1)	Cement concrete pavement	m^2	1256520	1028314	2284834
(2)	Asphalt concrete pavement	m^2	450651	-	450651
5	Culvert engineering	m/road	8375.8 / 1211	4339 / 765	12714.8/1976
(1)	Pipe culvert	m/road	104.5/ 17	-	104.5/ 17
(2)	Slab culvert	m/road	7188.8/1069	4339 / 765	11527.8/1834
(3)	Pipe culvert	m/road	1082.5/ 125	-	1082.5/ 125
6	Crossing	site	216	86	302

	engineering——grade crossing				
7	Highway facilities and embedded pipeline project	km	415.706	230.717	646.422
(1)	Safety facilities	Km	415.706	230.717	646.422
(2)	Other projects	Km	415.706	230.717	646.422
8	Greening and environmental protection project	km	415.706	230.717	646.422
9	New permanent land acquisition	hm^2	77.98	26.46	104.44
10	Building demolition	m^2	13555	8585	22140

2.6.1 Pavement engineering

According to the climate, the hydrologic condition, the roadbed soil and the supply of the road materials in the project area, the pavement design is implemented combined with the local construction and management experience. This project uses pitch and concrete pavement respectively. The pavement structures adopted in this project are as the following table 2.6-2.

Table 2.6-2 Pavement structure plan table

Road structure	**Class IV road with medium traffic volume (Dejing: width of roadbed is 6.5m)**	**Class IV road with large traffic volume (Dejing: width of roadbed is 6.5m)**	**Class IV road (Sinan: width of roadbed is 6.5m)**	**Class IV road (width of roadbed is 6.5m and 4.5m)**
Type	Type I(1)	Type I(2)	Type II(1)	Type II(2)
Surface course	asphalt concrete of 4cm	asphalt concrete of 4cm	cement concrete of 18cm	cement concrete of 18cm
Basic level	cement stabilized macadam of 20cm	cement stabilized macadam of 20cm	graded broken s-ne of 10 cm	graded broken s-ne of 10 cm
subbase	dry bound macadam of 15 cm	dry bound macadam of 20 cm	dry bound macadam of 15 cm	dry bound macadam of 15 cm
Mat layer	Big slag gravel of 15 cm	Big slag gravel of 15 cm	Big slag gravel of 15 cm	Big slag gravel of 15 cm

	(adopted in the roadbed with fresh soil)	(adopted in the roadbed with fresh soil)	(adopted in the roadbed with fresh soil)	(adopted in the roadbed with fresh soil)

2.6.2 Roadbed engineering

1 Cross section design of roadbed

(1) The standard cross section of the roadbed

15cm gap-filling macadam sub-base course, 20cm cement stabilized macadam base course and 4cm medium-sized asphalt concrete surface course are used for 6.5m wide roadbed of Dejiang Class IV roads with general traffic volume. The pavement structure of Type I (1) can be seen in the Figure 2.6-1.

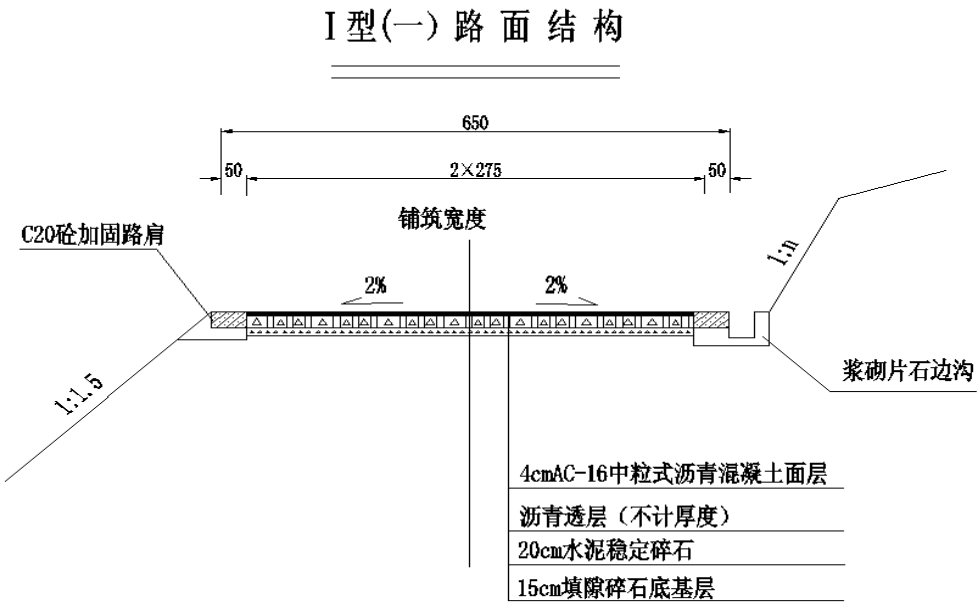


Figure 2.6-1 Pavement structure of Type I (1)

20cm gap-filling macadam sub-base course, 20cm cement stabilized macadam base course and 4cm medium-sized asphalt concrete surface course are used for 6.5m wide roadbed of Dejiang Class IV roads with large traffic volume. The pavement structure of Type I (2) can be seen in the Figure 2.6-2.

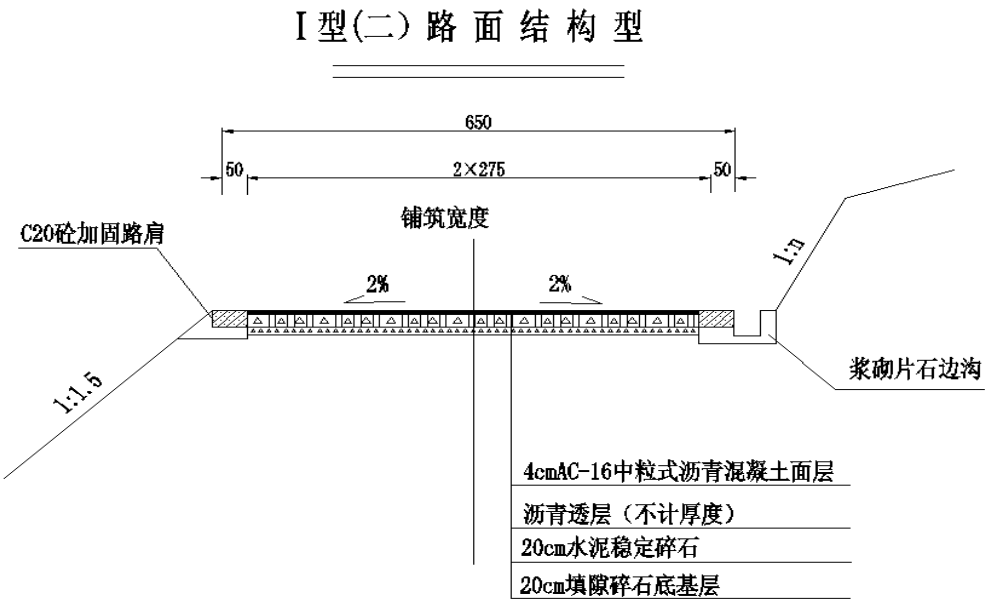


Figure 2.6-2 Pavement structure of Type I (2)

Fig. 9-2　Pavement structure, Type II (1)

15cm gap-filling macadam subbase course, 10cm graded macadam base course and 18cm cement concrete surface course are used for 6.5m wide roadbed of Sinan Class IV roads with large traffic volume. The pavement structure of Type II (1) can be seen in the Figure 2.6-3.

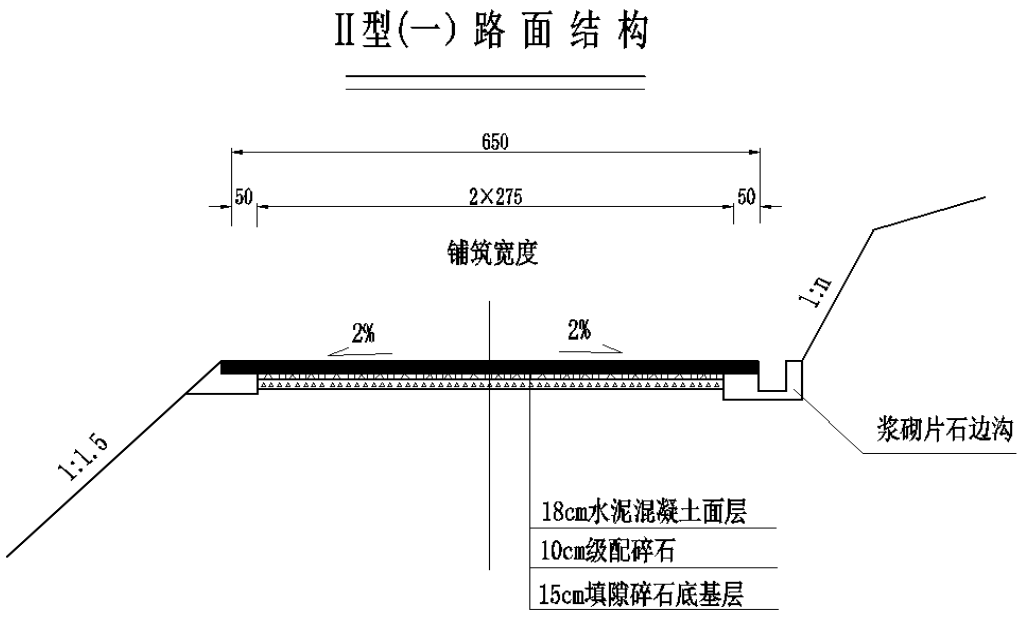


Figure 2.6-3 Pavement structure of Type II (1)

15cm gap-filling macadam subbase course, 10cm graded macadam base course and 18cm cement concrete surface course are used for 6.5m and 4.5 wide roadbed of Class IV roads. The pavement structure of Type II (2) can be seen in the Figure 2.6-4.

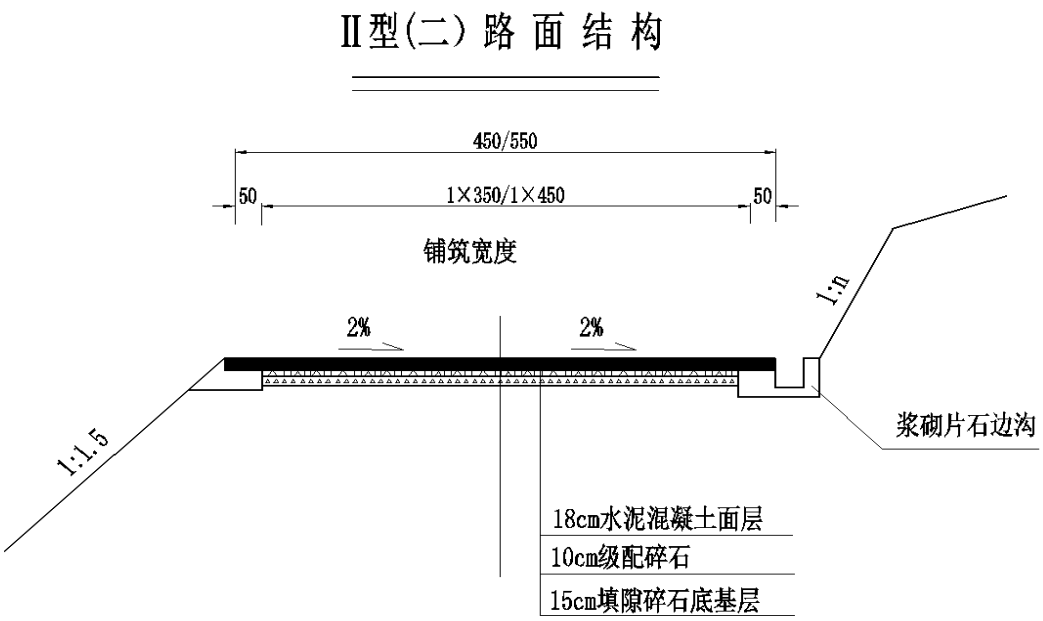


Figure 2.6-4 Pavement structure of Type II (2)

（2）Widen the cross section of the roadbed

1）Old road section is widened as follows：

①In case of the filled earth at the side to be widened, remove grass sod and tree root, form step, pave geogrid, fill and compact new roadbed.;

②In case of the filled stone at the side to be widened, fill stone to widen the roadbed and compact it. Roadbed compactness comes from heavy compaction. Stone is abundant and earth is lacked in this area. Therefore, the former will be used for roadbed filling. For zero fill and 0-0.3m/0.3-0.8m excavation, the filling size is less 100mm; for 0-0.8m and below 0.8m fill, the filling size is less than 2/3 thickness of

the layer.

2 Design elevation of roadbed

Most of the rural roads in this project are involved in reconstruction, taking centerline elevation as the designed elevation of roadbed. The designed elevation of some roadbeds along river and pond should meet the designed water level of 1/25 flood frequency plus the height of dammed water, the height of wave attack, and additional 0.5m.

3 The side slope of the roadbed and protective design

（1）Generally, the gradient of roadbed fill slope is 1:1.5. When embankment height is above 12m, a slope platform should be arranged every 10m. The platform is 2.0m wide, with 1:1.5 upper slope and 1:1.5-1.75 bottom slope.

（2）In case of roadbed excavation slope, the gradient of earth cutting should be rationally determined in accordance with engineering geology, hydrogeology, slope soil property, slope drainage and construction method of the excavation section, generally 1:1-1:1.5. The gradient of rock cutting should be determined in accordance with engineering properties, hydrogeological condition, slope height, drainage measures and construction method of the excavation section, generally 1:0.3-1:0.5 for limestone or dolomite slope.

（3）Protective engineering of the roadbed

Roadbed slope protection should be combined with road greening. Under the precondition of guaranteeing roadbed slope stability, it is preferred to take vegetative protection. Roadbed slope protection is designed as follows.

1) Fill roadbed slope is mainly protected by grass planting, supplemented by stone pitching and retaining wall. As for embankment with steep gradient along the route, which is restricted by terrain and land feature, it can be taken into account to construct retaining wall or shoulder retaining wall in accordance with slope height as well as geological and stratum conditions.

2) Excavation roadbed slope is protected by grass planting, facing wall or retaining wall in accordance with geological and stratum conditions as well as slope

gradient and height.

4 Drainage design of the roadbed and road surface

（1）The drainage of the roadbed

Perfect roadbed drainage system is composed of side ditch, intercepting ditch, torrent groove and drop. Water is drained off and flows in natural stream and culvert. According to different sections and requirements, the above drainage system is selected by this project. In principle, roadbed drainage will not produce mutual interference with fishpond.

In cutting section, the rectangular side ditch paved by 7.5# mortar rubble and covered by plate is arranged at the outer side of earth shoulder. When the length of side ditch is less than 200m, the cross section is 40×40cm; when the length of side ditch is more than 200m, the cross section is 60×60cm. In principle, ditch-water will be drained to natural stream nearby (torrent groove is arranged at the steeper outlet).

Based on the application, intercepting ditch can be divided into two types, that is, hillside intercepting ditch and platform intercepting ditch. The former is arranged at 5.00m outside the slope mouth above the cutting, where the section has a larger catchment area, generally 50×50cm trapezoidal or rectangular ditch, or curved ditch if necessary. The later is arranged at the slope platform in excavation slope section, generally 40×40cm rectangular ditch. Drop or torrent groove can be arranged at the steeper outlet of the intercepting ditch.

If underground water level in excavation cutting section is higher, a tubular seepage ditch can be arranged below the side ditch to discharge underground water, control the level below the unfavorable height, and maintain roadbed stability.

As for the reused old road, the side ditch and drainage ditch at the side to be widened must be removed and rebuilt.

（2）The drainage of the road surface

1) Rainwater on pavement should be drained to both pavement sides along transverse gradient, so as to avoid catchment of carriageway surface.

2) In case of gentle longitudinal gradient, little catchment, lower embankment and unwashed slope surface, the pavement water should be drained by means of horizontal gentle gradient.

3) In case that embankment is higher and slope surface is not protected and easy to be washed by pavement water, or the slope surface is protected but it is possible to be washed, it is needed to arrange an intercepting belt along outer side of road shoulder to collect pavement water, which is then drained from embankment through drain opening and torrent groove.

4) Pavement water is drained into side ditch along the shoulder, or discharged dispersedly from roadbed slope.

5 The treatment of special roadbed

In route selection, try to avoid the areas with poor foundation.

The treatment of special bad foundation should be based on the principle of adaptation to local conditions, use of local materials, economic and rational construction; at the same time, take the importance of engineering, incidence after destruction, factors of maintenance into account. Geological diseases in the area where the project roads pass through include karst, collapse and river erosion, which should be treated in accordance with different conditions.

Karst: According to its size and distribution, the measures of mortar rubble support, rubble stuffing and grouting fill can be taken; moreover it is required to give effort to drainage design.

Collapse: take active protection measures, such as lowering the side slope, clearance and flexible rock-capturing nets.

Landslide: Landslide prevention is a comprehensive management and one landslide prevention plan could cover multiple treatment measures. Generally speaking, landslide prevention measures include intercepting (draining) water, cutting slope and deloading, and stabilizing slope. Mainly there are three basic methods to stabilize slope, i.e. lower resistance measures, including gravity retaining wall, slide resistant pile retaining wall and new-type retaining structure; middle

fixation measures, including bolt (rope) anchoring, combined bolting and shotcrete anchoring and soil nailing mass anchoring; upper protection, including lattice slope protection, flexible net slope protection and biological slope protection.

Slide resistant pile is a large reinforced concrete structure, placed in rock and earth mass. By pile body, it can transfer the upper landslide thrust to the lower lateral rock and earth mass, and rely on lateral resistance of its lower pile to support the sliding force of landslide, so as to make landslide balanced or stabilized. For slide resistant pile is a large reinforced concrete structure embedded in rock and earth mass, it is difficult to be constructed and it is required to consume more materials with higher cost. So it is not used in general.

Anchor bolt retaining wall is mainly used in front of hillside, where up-right fill is needed. The retaining principle of anchor bolt retaining wall: the filled earth transfers the lateral pressure to the breast board, then to the anchor bolt, and last to the stable mountain mass, achieving the function of stabilizing the slope. Anchor bolt retaining wall is composed of anchor bolt, reinforced concrete face and counter-force support pillar, with the advantages of no strict demand to foundation, unlimited slope height and cost saving.

If special geological disease section is encountered and landslide is not very bad, it is recommended to adopt anchor bolt retaining wall. If landslide is severe, the route should be adjusted to save cost and ensure safety.

2.6.3 Bridge engineering

This project includes 20 small bridges, with total length of 423m, 10 medium bridges with total length of 415m. Altogether, there are 30 bridges with total length of 838m. Among them, there are 18 bridges in Dejiang County and 12 in Sinan County (see details in table 2.1-2); culvert 12714.8/1976m/1 (see details in table 2.6-3).the design load of the bridges: road-II; the designed flood frequency: large bridge 1/100；medium bridge 1/50；small bridge and culvert 1/25. All the culverts along the line adopt such two forms as reinforced concrete slab culvert and reinforced concrete circular pipe culvert. In the later construction drawing design,

proper culver form will be chosen according to the actual situations.

Table 2.6-3 the setting list of newly-built culverts

No	Road name	number of culverts	length of culverts（m）	No	Road name	number of culverts	length of culverts （m）
1	Mingxi - Dongquan	37	263.4	44	Wujiagou - Xujiashan	14	80.4
2	Jiancha - Shaxi	69	547.0	45	Changtan - Yuanchang	10	50.0
3	Hepeng - Longxi	31	266.0	46	Xiaping - Xintan	13	69.0
4	Qinjiawan - Chaodi	27	221.0	47	Xiajie - Shangchanggou	9	50.0
5	Changba - Wangpai	27	195.0	48	Matixi - Meijia	15	89.7
6	Pingyuan - Nangan	73	512.0	49	Lizitan - Huangjia	10	58.0
7	Datu - Huangba	41	269.0	50	Lizishui - Chenjia	6	29.0
8	Jiancha - Dahe	10	78.0	51	Matixi - Guanlin	9	55.0
9	Changfeng - Duoping	44	316.0	52	Zhoujia - Huangbayan	12	63.9
10	Fengjiazhai - Zhayu	41	316.0	53	Tujia - Zhuangyan	11	59.5
11	Qiaotou - Yanjing	22	155.0	54	Real Estate Board - Xiaogou	4	20.0
12	Banzhuyuan -	20	155.0	55	Huangbawanxi	10	62.0

	Hepeng				ao - Qinba		
13	Baiguoduo - Longqiao	51	308.0	56	Ganxi bridge head - Aojia	24	168.2
14	Wenping - Yinsi	28	180.0	57	Dahe - Longxi	16	99.7
15	Zhangxinjie - Yanmen	11	60.0	58	Fenglin - Qingqiushu	12	81.2
16	Weiangzui - Gonghe	12	70.0	59	Yanshang - Kuangshanzhang	31	195.9
17	Xinchang - Changxian	24	175.0	60	Wengwen - Tunshan	17	88.0
18	Meizi - Huanyuanzi	17	120.0	61	Paotongshu - Dawan	47	526.0
19	Hetou - Dayuan	52	287.4	62	Wengxi - Sanxing	64	735.0
20	Xiaba - Yalaoshan	18	99.0	63	Wengsan Road - Lianmeng	46	256.7
21	Laozhai - Daba-u	8	52.0	64	Zaiziba - Huangnitian	15	91.0
22	Sancengyan - Anshan	9	43.5	65	Wenxi Township Governement - Changzheng	38	205.0
23	Changba - Xintan	9	72.0	66	Sanxing - Shangba	39	221.0
24	Shenxikou - Huangtu	6	31.5	67	Wengsan Road - Tangjiaba	19	111.5
25	Chazishan- Phenix	8	42.0	68	Yanmenkou - Sanxing	38	205.0

26	Dejiang - Luqing	71	504.1	69	Tangben Road - Antang	28	187.0
27	Gonghe Bridgehead - Hualiangai	9	54.0	70	Aijiashan - Xinming	20	135.0
28	Fishery - Daping	11	79.0	71	Yongixn - machi	14	88.6
29	Dingjiashan - Chawotuo	7	40.0	72	Tangben Road - Shuanghe	44	214.0
30	Fengxi - -ngwan	18	101.0	73	Donghuaxiang - Dongguaxi	18	96.0
31	Laoshuixi - Guanzhuang	10	67.8	74	Zhangting Road - Liangtian	28	147.0
32	Nanzhugou - Dengjia	8	45.0	75	Zhangting Road - Baowei	7	32.0
33	Xinzhai - Zaonixi	6	39.0	76	Baiyangping - Nanshan	20	104.0
34	Dashuwan - Jiantai	24	130.0	77	Lancaocha - Meizibao	37	190.0
35	Huoyantu - Zaojiaodou	12	63.0	78	Longshui - Chaxi	45	224.0
36	Huangjia - Huangba 3rd team	12	65.5	79	Shanggongqing - Langan	31	202.1
37	Kedian - Tianxing Bridge	16	90.0	80	Zhangting Road - Jinggang	20	101.5
38	Shaxiyakou - Datuwan	19	105.0	81	Liangshuijing - Guankou	23	167.0
39	Longzhai -	32	186.5	82	Nixi - Caer	36	234.0

	Ranjiawan						
40	Township Government - Pengjiazhai	12	70.0	83	Pujiagou - Dashan	12	62.0
41	Shanshuba - Taowan	7	40.0	84	Dongqing'ao - Dongjiawan	50	265.0
42	Heduimen - Xintang	5	25.0	85	Qinglongzui - Zhuguaxi	29	148.0
43	Chaodi - Chenyuan	19	100.0	86	Liangtian - Shanxing	22	137.1

2.6.4 Drainage Project

Because this project, only involving village roads of Class IV, has no service facilities, the Scientific Research of this project engineering only consider the drainage of the roads. The rain comes - the ditches through the drainage ditch of both sides of the roads. When there is underground water under the road, such methods as blind ditch absorption and collection are adopted - guarantee the stability of the roadbed.

2.6.5 Ancillary works

1. Traffic safety and management facilities: Safety facilities are important measures to prevent or reduce road accident and ensure smooth traffic. As for the roads of this project, the safety facilities include traffic signs, markings, guardrails, speed bumps, and so on.

2. Landscape engineering: Road landscaping is not only part of the earth landscaping but also an indispensable part of road. No matter the overall planning of road, detailed design, building construction or the maintenance management, they are all important parts of it.

Road landscaping mainly consider the natural circumstances along the road - make the greening design. It makes special greening design for both sides of the road.

2.6.6 Quantity of the sub-grade earthwork

In the recommended scheme of Feasibility Study Report of this project, the amount of excavation earth work is 58777800 m^3; the use amount is 1389400m^3, the fill amount is 1767800 m^3; the borrow amount is 38100m^3， the abandon amount is 4014300m^3. The amount of excavated earth work of the road project is 5687700m^3; the use amount is 1379400m^3; the fill amount is 1767800m^3， the borrow amount is 38100m^3; the abandon amount is 4014300m^3； The amount of excavated earth work of the bridge project is 10000m^3; the use amount is 10000m^3. No fill, borrow or abandon. The detailed amount of earth work in this project can be seen in the table 2.6-4.

Table 2.6-4 Balanced schedule of earthwork in the project area

No.	Project name	Length (km)	Excavation (m3)			Amount of utilization ((m3)			Amount of fill (m3)	Amount of borrow (m3)	Amount of abandon (m3)
			Total	Earth	Stone	Total	Earth	Stone			
Total			5877751	2558003	3320775	1389421	535183.5	847119.5	1767832	38131	4014317
I. Rural road											
Total		646.422	5867712	2552147	3316592	1379382	529327.3	842936.5	1767832	38131	4014317
(1) Dejiang rural road		415.705	3409329	1571988	1838368	783704	357506	419100	1140756	38131	2183122
1	Mingxi to Dongquan	10.578	49302.1	26218.2	23083.9				23393.5		25908.6
2	Jiancha to Shaxi	22.133	157095	68541	88554	24469	10164	14305	24469		132626
3	Hepeng to Longxi	15.760	39844	19422	20422				73726	33882	
4	Qinjiawan to Chaodi	10.205	21505	9382	12123	7972		7972	8631		12874
5	Changba to Wangpai	8.965	50937	10032	40905	12186	3020	9166	12186		38751
6	Pingyuan to Nangan	21.324	123583	30113	93470						
7	Datu to Huangba	9.156	90755	28802	61953	16383	4727	11656	16075		74680
8	Jiancha to Dahe	4.654	66789	36734	30055				30487		36302
9	Changfeng to Duoping	15.598	246148	88116	158032	41721	18429	23292	41721		204427
10	Fengjiazhai ti Zhayu	9.812	5655	1130	4525	8050	800	7250	8050	2395	
11	Qiaotou to Yanjing	8.353	123057	50908	72149	22934	5413	17521	22934		100123
12	Banzhuyuan to Hepeng	8.975	92010	65800	26210				17250		74760
13	Baiguotuo to Longqiao	17.143	103202	39102	64100	12903		12903	12903		90299
14	Wenping to Yinsi	10.080	152419	60171	92248	10578	2178	8400	10578		141841
15	Zhangxinjie to Yanmen	3.746	8904	3106	5798	2504	1060	1444	2504		6400
16	Weigangzui to Gonghe	3.960	18142	7792	10350	7666	3542	4124	7666		10476
17	Xinchang to	7.791	85573	34229	51344				37810		47763

	Changxian										
18	Meizi to Huayuanzi	6.108	27088	10835	16253				19664		7424
19	Hetou to Dayuan	19.005	99069	57048	42021				25988		73081
20	Xiaba to Yalaloshan	6.073	29314	11723	17591	25198	10014	15184	25198		4116
21	Laozhai to Dabatou	2.537	7530	1506	6024				9384	1854	
22	Sancengyan to Anshan	4.680	17472	4263	13209	5742	2773	2969	5742		11730
23	Changba to Xintan	5.943	43740	21985	21755	6614	2830	3784	6614		37126
24	Shenxiyakou to Huangtu	3.018	40945	12267	28678	1752	618	1134	1752		39193
25	Chazishan to Fenghuang	5.288	47812	24012	23800	26309	12840	13469	26309		21503
26	Dejiang to Luqing	26.450	341862	201716	140146	318457	185488	132969	318457		23405
27	Gongheqiaotou to Lianhua	2.890	10149	2023	8126	2001	403	1598	2001		8148
28	Fish yard to Daping	3.335	46905	18533	28372	17540	7197	10343	17540		29365
29	Dingjiashan to Chawotuo	3.990	20533	4461	16072	5089	1178	3911	5089		15444
30	Fengxi to Dongwan	7.567	80613	34925	45688	30214	13842	16372	30214		50399
31	Laoshuixi to Guanzhuang	2.781	34231	16077	18154				11933		22298
32	Lanzhugou to Dengjia	2.623	17721	9447	8274	2478	1158	1320	2478		15243
33	Xinzhai to Zaonixi	1.516	6201	2324	3904				6174		27
34	Dashuwan to Jiantai	8.271	114521	56658	57863				13406		101115
35	Huoyanshan to Zaojiaodou	4.806	26719	18806	7913				6639		20080
36	Huangjia to Huangba group 3	3.180	21769	4032	17737	2962	608	2354	2962		18807
37	Kedian to Tianxing Bridge	5.480	55616	22249	33367	33188	15041	18147	33188		22428
38	Shaxiyakou to Datouwan	5.923	68963	44826	24137				24972		43991

39	Longzhai to Ranjiawan	10.728	41146	20573	20573				19454		21692
40	Township Government to Pengjia Village	3.550	25515	6874	18641	3228	1102	2126	3228		22287
41	Shanshuba to Taowan	2.207	14602	4474	10128	1655	563	1092	1655		12947
42	Heduimen ro Xiantang	2.208	11454	6873	4581				4948		6506
43	Chaodi to Chengyuan	7.190	99302	40464	58838	25718	12235	13483	25718		73584
44	Wujiagou to Xujiashan	3.618	23502	21156	2346				4973		18529
45	Changtan to Yuanchang	3.743	17757	2162	15595	4998	692	4306	4998		12759
46	Xiaping to Xintan	7.523	57084	37476	19608	3755	445	3310	3755		53329
47	Xiajei to Shangchanggou	3.439	16409	6205	10204	12741	3886	4876	12741		3668
48	Matixi to Meijia	4.706	53904	36986	16918				24445		29459
49	Lizitan to Huangjia	3.943	66455	36308	30147	7639		4520	7639		58816
50	Lizishui to Chenjia	2.000	11714	3513	8201	2468	738	1730	2468		9246
51	Matixi to Guanlin	3.616	76686	30650	46036	8851		8851	8851		67835
52	Zhoujia to Huangbayan	4.034	35892	30672	6220				2054		33838
53	Xujia to Zhuangyan	6.235	84632	40028	44604	17536	9908	7628	17536		67096
54	House property bureau to Xiaogou	1.314	2790	1678	1112	767	462	305	767		2023
55	Huangbawanxiao to Qinba	3.413	10794	5397	5397	1771		1771	1771		9023
56	Ganxiqiaotou to Aojia	6.458	33506	14253	19253	7382	3668	3714	7382		26124
57	Dahe to Longxi	4.303	26097	19196	6901	6985	5025	1960	6985		19112
58	Fenglin to	3.341	34904	15697	19207	14514	6655	7859	14514		20390

	Qingqiushu										
59	Yanshang to Kuangshan	8.44	71491	32039	39452	18786	8804	9982	18786		52705
(2) Sinan rural road		230.717	2458383	980159.1	1478224	595677.8	171821.3	423836.5	627075.9	0	1831195
60	Wengwen to Tunshan	7.646	58892	25081	33811	10891	4793	6098	10752		48140
61	Paotongshu to Dawan	13.330	89926	40092	49834	12678	5114	7564	12708		77218
62	Wengxi to Sanxing	12.988	46034	20284	25750	14359	6387	7972	14152		31882
63	Wengsan Road to Lianmeng	12.352	137798	43267	94531	41892		41892	62973		74825
64	Zaoziping to Huangnitian	5.736	43993	24880	19113	3028		3028	3277		40716
65	Wengxi Town Government to Changzheng	13.297	155981	48007	107974	42886	13753	29113	43505		112476
66	Sanxing to Shangba	8.276	61092	19717	41375	9290	3295	5995	9346		51746
67	Wengsan Road to Tangjia	4.851	62100	23430	38670	15497	5281	10216	15656		46444
68	Yanmenkou to Sanxing	8.942	121064	41917	79147	45798	19912	25886	45296		75768
69	Tangben Road to Antang	7.574	47541	11746	35795	9524	2736	6788	9727		37814
70	Aijiashan to Xinming	9.625	178184.9	92378.4	85806.5	68391.9	14939.3	53452.6	66414.8		111770
71	Yongxing to Machi	7.297	50265.5	21329.7	28935.8	2191.9		2191.9	8854.1		41411
72	Tangben Road to Shuanghe	14.470	279626	135660	143966	32018	14514	17504	31655		247971
73	Donghua Village to Dongguaxi	6.605	49951	22893	27058	16002		16002	17385		32556
74	Zhangting Road to Liangtian	8.078	54349	23141	31208	4367	1920	2447	4304		50045
75	Zhangting Road to	4.555	53011	11036	41975	3976	1168	2808	4050		48961

	Baowei										
76	Baiyangping to Nanshan	3.175	39020	15607	23413	8746	3935	4811	8625		30395
77	Lancaocha to Meizibao	3.974	93337	39133	54204	3064		3064	3326		90011
78	Longshui to Chaxi	14.320	157481	69703	87778	15716		15716	17062		140419
79	Shangguanqing to Langan	8.411	127102	44008	83094	127000	44000	83000	127000		
80	Zhangting Road to Jinggang	6.816	52286	17847	34439	5836	684	5152	5841		46445
81	Liangshuijing to Guankou	11.997	90923	39724	51199	14127		14127	15329		75594
82	Nixi to Ca'er	9.728	122856	39512	83344	35526	11962	23564	35526		87330
83	Pujiagou to Dashan	2.226	26231	5243	20988	7183	1756	5427	7414		18817
84	Dongqing'ao to Huangjiawan	11.563	124600	55547	69053	16228	7267	8961	15992		108608
85	Qinglongju to Zhuguanxi	6.845	66361	21896	44465	20384	8405	11979	21043		45318
86	Liantian to Shanxing	6.040	68378	27080	41298	9078		9078	9863		58515
No.	**Project name**	**Length (km)**	**Excavation (m3)**			**Amount of utilization (m3)**			**Amount of fill (m3) Earth**	**Amount of borrow (m3) Stone**	**Amount of abandon (m3) Total**
			Total	**Earth**	**Stone**	**Total**	**Earth**	**Total**			
II. Bridge											
Total		836.6	10039.2	5856.2	4183	10039.2	5856.2	4183	0	0	0
(1) Dejiang bridge		539.5	6474	3776.5	2697.5	6474	3776.5	2697.5	0	0	0
1	Lengshuijie Bridge	73	876	511	365	876	511	365	0	0	0
2	Jiangjiagou Bridge	42.5	510	297.5	212.5	510	297.5	212.5	0	0	0
3	Fengjiazhai Bridge	15	180	105	75	180	105	75	0	0	0
4	Chuanqian Bridge	36	432	252	180	432	252	180	0	0	0
5	Huangnidui Bridge	24	288	168	120	288	168	120	0	0	0
6	Pianyan Bridge	22	264	154	110	264	154	110	0	0	0

7	Xianlong Bridge	36	432	252	180	432	252	180	0	0	0
8	Guanyinyan Bridge	41	492	287	205	492	287	205	0	0	0
9	Tianba Bridge	23	276	161	115	276	161	115	0	0	0
10	Shenxi Bridge	28	336	196	140	336	196	140	0	0	0
11	Yanjing Bridge	18	216	126	90	216	126	90	0	0	0
12	Xiaoxigou Bridge	15	180	105	75	180	105	75	0	0	0
13	Tanjiashan Bridge	20	240	140	100	240	140	100	0	0	0
14	Xinlong Bridge	33	396	231	165	396	231	165	0	0	0
15	Dongmenqian Bridge	34	408	238	170	408	238	170	0	0	0
16	Hengshiliang Bridge	24	288	168	120	288	168	120	0	0	0
17	Zhongxi Bridge	34	408	238	170	408	238	170	0	0	0
18	Dashuituo Bridge	21	252	147	105	252	147	105	0	0	0
(2) Sinan Bridge		539.5	6474	3776.5	2697.5	6474	3776.5	2697.5	0	0	0
19	Tangjiaba Bridge	18.0	216	126	90	216	126	90	0	0	0
20	Kongjiahe Bridge	29.0	348	203	145	348	203	145	0	0	0
21	Juanziwan Bridge	26.0	312	182	130	312	182	130	0	0	0
22	Meizibao Bridge	30.0	360	210	150	360	210	150	0	0	0
23	Yandixia Bridge	18.0	216	126	90	216	126	90	0	0	0
24	Mayangdong Bridge	14.0	168	98	70	168	98	70	0	0	0
25	Qinglongju Bridge	40.5	486	283.5	202.5	486	283.5	202.5	0	0	0
26	Guihua Bridge	35.0	420	245	175	420	245	175	0	0	0
27	Danianfang Bridge	16.8	201.6	117.6	84	201.6	117.6	84	0	0	0
28	Yuanjiahao Bridge	15.8	189.6	110.6	79	189.6	110.6	79	0	0	0
29	Sanchatang Bridge	35.0	420	245	175	420	245	175	0	0	0
30	Sanxing Bridge	19.0	228	133	95	228	133	95	0	0	0

Source: *Feasibility Study Report on Tongren Rural Road Project Financed by the World Bank Loan*

2.6.7 Stock yard, waste slag field

Except for the stones utilised and excavated per se, other building stones needed for the proposed highway engineering shall be purchased, and no stock yard would be provided. Engineering materials such as cement, sand and asphalt shall be purchased as well. This project does not provide stock yard, and asphalt and concrete mixing station. Based on the FSR, this project provides a total of 80 spoil grounds along the road, which are distributed beside various roads of the project respectively, with the closest distance of 3 m, longest distance of 300 m and storage capacity of 4583.9 thousand m^3, and 4014.3 thousand m^3 spoil of the project can be stacked, as shown in the Table 2.6-5.

2.6.8 Project demolition and relocation

According to the investigation and statistics of *Action Plan for Resettlement of Affected Residents* for the project, affected buildings to be demolished by this project cover a total of 22140 m^2, including those with structures of bricks and compounds 11457 m^2, bricks and timbers 8069 m^2, and timbers 1526 m^2. The affected land attachments mainly include sheds 4528 m, fence 2290.4 m, 123 tombs, and 346 poles. Therein, buildings to be demolished in Dejiang County covers a total of 13555 m^2, including those with structures of bricks and compounds 8942 m^2, bricks and timbers 4779 m^2, timbers 96 m^2, as well as sheds 3405 m, fence 2017.4 m, 82 tombs, and 301 poles; buildings to be demolished in Sinan County covers a total of 8585 m^2, including those with structures of bricks and compounds 2515 m^2, bricks and timbers 3290 m^2, timbers 1430 m^2, as well as sheds 1123 m, fence 273 m, 41 tombs, and 45 poles. As this project is a linear project, the number of the affected villages, households and people is relatively large, although the amount of land requisition and building demolition is not big. According to the preliminary investigation, there are a total of 3837 households, 14772 people affected by the project, including 2829 households, 10650 people in Dejiang, and 1008 households, 4002 people in Sinan.The affected households are mainly influenced by the project of land requisition. On the basis of preliminary statistics, the number of households affected by land requisition only is up to 3758, accounting for 97.9% of

the total affected households, and the number of households affected by land requisition and demolition at the same time is 79, taking up only 2.1% of the total amount.

2.6.9 Source and consumption of labor and main materials for this project

According to the FSR statistics, all the asphalt and concrete are purchased, and no asphalt or concrete mixing station will be provided along the road. Besides, all earthworks for the project are purchased, no stock yard or earth-fetching area will be provided along the road. The consumptions of labor and main materials for this project are shown in Table 2.6-6.

Table 2.6-5 Summary table for proposed spoil (residue) ground condition of this project

No.	Road	Location stake mark	Azran (m)	Type	Occupied Area (hm2)	Effective Storage Capacity (m3)	Remarks
1#	Mingxi to Dongquan	K1+700 K8+160	Left10 Right10	Barren Dryland、Wasteland	0.346	3.11	
2#	Jiancha to Shaxi	K2+500 K17+100	Right 40 Right 200	Barren Dryland、Mountain	1.769	15.92	
3#	Hepeng to Longxi	K3+260 K12+960	Left 10 Right 10	Barren Dryland、Mountain	0.452	4.07	Borrow area
4#	Qinjiawan to Chaodi	K5+300	Right 80	Barren Dryland、Mountain	0.171	1.54	
5#	Changba to Wangpai	K4+460	Left 40	Barren Dryland、Mountain	0.517	4.65	
6#	Pingyuan to Nangan	K2+800	Left 10	Wasteland	0.400	3.6	
7#	Datu to Huangba	K2+700 K5+700	Right 30 Right 20	Barren Mountain	0.996	8.96	
8#	Jiancha to Dahe	K2+920	Right 20	Wasteland	0.484	4.36	
9#	Changfeng to Duoping	K1+600 K25+260	Left 20 Left 30	Barren Dryland、Mountain	2.726	24.53	
10#	Fengjiazhai ti Zhayu	K6+400	Right 30	Barren Dryland、Mountain	0.032	0.29	Borrow area
11#	Qiaotou to Yanjing	K3+800 K6+400	Right 80 Right40	Barren Dryland、Mountain	1.334	12.01	
12#	Banzhuyuan to Hepeng	K1+520 K4+180	Left 10 Right 20	Barren Mountain	0.997	8.97	
13#	Baiguotuo to Longqiao	K11+200	Left 30	Barren Dryland、Mountain	1.204	10.84	
14#	Wenping to Yinsi	K3+720 K8+840	Left 20 Left 30	Barren Dryland、Mountain	1.891	17.02	
15#	Zhangxinjie to Yanmen	K0+300	Right 30	Barren Dryland	0.086	0.77	
16#	Weigangzui to	K0+700	Right 30	Barren Dryland	0.140	1.26	

No.	Road	Location stake mark	Azran (m)	Type	Occupied Area (hm2)	Effective Storage Capacity (m3)	Remarks
	Gonghe						
17#	Xinchang to Changxian	K5+480	Right 30	Barren Mountain	0.637	5.73	
18#	Meizi to Huayuanzi	K2+960	Left 300	Wasteland	0.099	0.89	
19#	Hetou to Dayuan	K5+900 K13+300	Right 30 Left 40	Barren Dryland、Mountain	0.974	8.77	
20#	Xiaba to Yalaloshan	K5+700	Left 10	Barren Mountain	0.054	0.49	
21#	Laozhai to Dabatou	K1+300	Left 10	Barren Mountain	0.024	0.22	Borrow area
22#	Sancengyan to Anshan	Branch K0+840	Right 10	Barren Dryland	0.157	1.41	
23#	Changba to Xintan	K3+340	Right 20	Barren Dryland	0.496	4.46	
24#	Shenxiyakou to Huangtu	K2+900	Left 20	Barren Dryland	0.522	4.7	
25#	Chazishan to Fenghuang	K0+000	Right 30	Barren Dryland	0.287	2.58	
26#	Dejiang to Luqing	K0+400 K10+500 K25+700	Left 60 Right 20 Left 20	Wasteland	0.312	2.81	
27#	Gongheqiaotou to Lianhua	K2+240	Right 30	Barren Dryland、Mountain	0.109	0.98	
28#	Fish yard to Daping	K0+500	Right 60	Barren Dryland、Mountain	0.391	3.52	
29#	Dingjiashan to Chawotuo	K3+920	Right 30	Barren Dryland、Mountain	0.206	1.85	
30#	Fengxi to Dongwan	K3+200	Right 40	Barren Dryland、Mountain	0.672	6.05	
31#	Laoshuixi to Guanzhuang	K1+360	Right 200	Wasteland	0.298	2.68	
32#	Lanzhugou to Dengjia	K0+000	Right 200	Barren Mountain	0.203	1.83	

No.	Road	Location stake mark	Azran (m)	Type	Occupied Area (hm2)	Effective Storage Capacity (m3)	Remarks
33#	Xinzhai to Zaonixi						Do not need one due to balance excavation and filling
34#	Dashuwan to Jiantai	K4+360	Right 30	Wasteland	1.348	12.13	
35#	Huoyanshan to Zaojiaodou	K2+300	Right 20	Barren Mountain	0.268	2.41	
36#	Huangjia to Huangba group 3	K1+800	Right 20	Barren Dryland	0.251	2.26	
37#	Kedian to Tianxing Bridge	K3+500	Left 10	Barren Mountain	0.169	1.52	
38#	Shaxiyakou to Datouwan	K2+300	Right 10	Wasteland	0.299	2.69	
39#	Longzhai to Ranjiawan	K2+900 K7+300	Right 30 Left 40	Barren Dryland、Mountain	0.289	2.6	
40#	Township Government to Pengjia Village	K0+400	Right 30	Barren Dryland、Mountain	0.297	2.67	
41#	Shanshuba to Taowan	K1+150	Left 20	Barren Dryland	0.172	1.55	
42#	Heduimen ro Xiantang	K1+050	Left 20	Barren Mountain	0.087	0.78	
43#	Chaodi to Chengyuan	K3+200	Right 40	Barren Dryland、Mountain	0.981	8.83	
44#	Wujiagou to Xujiashan	K1+600	Left 10	Barren Mountain	0.247	2.22	
45#	Changtan to Yuanchang	K1+760	Right 20	Barren Dryland、Mountain	0.170	1.53	
46#	Xiaping to Xintan	K4+600	Left 20	Barren Mountain	0.711	6.4	
47#	Xiajei to Shangchanggou	Branch K0+400	Right 30	Barren Dryland	0.049	0.44	

No.	Road	Location stake mark	Azran (m)	Type	Occupied Area (hm2)	Effective Storage Capacity (m3)	Remarks
48#	Matixi to Meijia	K2+100	Left 20	Barren Mountain	0.393	3.54	
49#	Lizitan to Huangjia	Branch K0+500	Right 40	Barren Dryland、Mountain	0.784	7.06	
50#	Lizishui to Chenjia	K0+900	Left 20	Barren Mountain	0.123	1.11	
51#	Matixi to Guanlin	K1+300	Left 20	Barren Mountain、Barren Dryland	0.904	8.14	
52#	Zhoujia to Huangbayan	K2+200	Left 20	Barren Mountain	0.451	4.06	
53#	Xujia to Zhuangyan	K3+000	Left 20	Barren Mountain、Woodland	0.894	8.05	
54#	House property bureau to Xiaogou	K0+600	Left 20	Barren Mountain	0.027	0.24	
55#	Huangbawanxiao to Qinba	K1+400	Left 70	Barren Dryland	0.120	1.08	
56#	Ganxiqiaotou to Aojia	K5+700	Left 10	Barren Mountain	0.348	3.13	
57#	Dahe to Longxi	K2+480	Left 10	Barren Mountain	0.254	2.29	
58#	Fenglin to Qingqiushu	K2+200	Right 50	Barren Dryland	0.272	2.45	
59#	Yanshang to Kuangshan	K5+640	Left 10	Barren Mountain	0.702	6.32	
60#	Wengwen to Tunshan	K4+060	Right 20	Barren Dryland	0.642	5.78	
61#	Paotongshu to Dawan	K5+400	Left 3	Barren Dryland、Mountain	1.030	9.27	
62#	Wengxi to Sanxing	K2+520 K8+200	Right 20 Left 40	Barren Dryland、Mountain	0.426	3.83	
63#	Wengsan Road to Lianmeng	K5+420 K10+220	Left 20 Left 30	Barren Dryland、Mountain	0.998	8.98	
64#	Zaoziping to	K1+700	Right 30	Barren Dryland、	0.543	4.89	

No.	Road	Location stake mark	Azran (m)	Type	Occupied Area (hm2)	Effective Storage Capacity (m3)	Remarks
	Huangnitian			Mountain			
65#	Wengxi Town Government to Changzheng	K1+360 Branch3K0+280	Left 20 Left 10	Barren Dryland、Mountain	1.500	13.5	
66#	Sanxing to Shangba	K4+800	Left 20	Barren Dryland、Mountain	0.690	6.21	
67#	Wengsan Road to Tangjia	Branch K0+400	Left 50	Barren Dryland、Mountain	0.619	5.57	
68#	Yanmenkou to Sanxing	K5+630	Left 60	Barren Dryland、Mountain	1.010	9.09	
69#	Tangben Road to Antang	K4+020	Left 30	Barren Dryland、Mountain	0.504	4.54	
70#	Aijiashan to Xinming	K2+790 K5+970	Right 30 Right 40	Barren Mountain	1.490	13.41	
71#	Yongxing to Machi	K0+380 Branch2K0+140 Branch3 starting point	Right 20 Right 23 Left 20	Barren Dryland	0.552	4.97	
72#	Tangben Road to Shuanghe	K7+460 Branch2K1+480	Right 20 Right 20	Barren Dryland、Mountain	3.307	29.76	
73#	Donghua Village to Dongguaxi	K3+360	Right 30	Barren Dryland、Mountain	0.434	3.91	
74#	Zhangting Road to Liangtian	K1+490 BranchK1+330	Left 30 Left 30	Barren Mountain、Barren Dryland Barren Mountain、Barren Dryland	0.668	6.01	
75#	Zhangting Road to Baowei	K2+460	Right 40	Barren Dryland	0.653	5.88	

No.	Road	Location stake mark	Azran (m)	Type	Occupied Area (hm2)	Effective Storage Capacity (m3)	Remarks
76#	Baiyangping to Nanshan	K1+600	Right 20	Barren Dryland、Mountain	0.406	3.65	
77#	Lancaocha to Meizibao	K1+240	Left 20	Barren Dryland、Mountain	1.200	10.80	
78#	Longshui to Chaxi	K5+360	Right 30	Barren Dryland、Mountain	1.872	16.85	
79#	Shangguanqing to Langan						Do not need one due to balance excavation and filling
80#	Zhangting Road to Jinggang	Branch K0+700	Left 30	Barren Dryland、Mountain	0.619	5.57	
81#	Liangshuijing to Guankou	K3+200	Right 30	Barren Dryland、Mountain	1.008	9.07	
82#	Nixi to Ca'er	K5+840 BranchK1+100	Right 20 Right 20	Barren Dryland、Mountain	1.164	10.48	
Total					50.931	458.39	

Source: *Feasibility Study Report on Tongren Rural Road Project Financed by the World Bank Loan*

Table 2.6-6 Summary table for manual work and main material quantity

Project	Labor (working day)	Wood (m3)		Steel (t)	Cement (t)	Asphalt (t)
		Raw wood	Sawn timber			
Total	**3046211**	**1750**	**1174**	**5706**	**262911**	**7678**
Dejiang County	1918940	1213	804	3424	156251	6949
Sinan County	1127271	537.0	370	2282	106660	729

Source: *Feasibility Study Report on Tongren Rural Road Project Financed by the World Bank Loan*

2.6.10 Land occupation of the proposed project

This project covers a total area of 181.84 hm2, including permanent land occupation of 104.44 hm2, accounting for 57.44%; temporary land occupation of 77.4 hm2, accounting for 42.56%. Permanent land includes: cultivated land 33.87 hm2 (all dryland), garden plot 2.07 hm2, forest land 3.94 hm2 (shrubbery), unused land 62.16 hm2, and construction land 2.4 hm2 (the original rural road). Temporary land includes: cultivated land 19.3 hm2 (all dryland), and forest land 58.1 hm2 (shrubbery). Detailed land occupation situation of this project is shown in the Table 2.6-7.

Table 2.6-7 Land requisition type and quantity of this project

Sub item Name		Permanent land requisition type and quantity (hm2)					
		Cultivated land（Dryland）	**Garden plot**	**forest land（Scrubland）**	**Unused land**	**Construction land (Rural road)**	**Total**
Dejiang county	59 rural roads rebuilding and 18 bridges construction	23.40	1.92	2.90	47.55	2.21	77.98
Sinan County	27 rural roads rebuilding and 12 bridges construction	10.47	0.15	1.04	14.61	0.19	26.46
Subtotal		**33.87**	**2.07**	**3.94**	**62.16**	**2.40**	**104.44**
		Temporary land（hm2）					
		Cultivated land（Dryland）	**Garden plot**	**forest land（Scrubland）**	**Unused land**	**Construction land (Rural road)**	**Total**
Construction camp		4.5	-	10.6	-	-	15.1
Construction road		2.3	-	4.8	-	-	7.1
Temporary spoil ground、 stacking		12.5	-	42.7	-	-	55.2
Subtotal		19.3	-	58.1	-	-	77.4
Total amount		**53.17**	**2.07**	**62.04**	**62.16**	**0.19**	**181.84**

Source: *Feasibility Study Report on Tongren Rural Road Project Financed by the World Bank Loan*

2.7 Scheme Comparison

As this project is a rural road reconstruction project, all the rural roads are existing roads, the original roadbeds are to be widened, and the original soil, gravel roads are to be transformed into cement, asphalt pavements. Besideds, as they are all ranked at a low level of Level 4, the routes would remain unchanged and there would no route comparison scheme.

For the new bridges, their locations are basically on the original village road. The vehicles can pass by means of the existing simple cover plates or riverbed directly. Therefore, the bridges are mainly located at the crossing river points of the roads. It is proposed that 30 bridges are to be constructed, including 18 medium bridges, 12 small bridges, and 0 big bridges, with small span and no comparison scheme. A simple comparison and selection between Lengshuijie Bridge in Dejiang County and Qinglongju Bridge in Sinan County with relatively larger river span will be made here.

1. Lengshuijie Bridge in Dejiang County

Lengshuijie Bridge is located at a point on the road between Changfeng and Duoping. Recommended scheme adopts 4-16 m hollow slab bridge, with the length of 73 m and the cost of RMB 3.2 million; compared scheme adopts 2-30 m box beam bridge, with the length of 73 m and a cost of RMB 4.16 million. Detailed comparison is shown in Table 2.7-1. It can be seen from the table that the recommended scheme in *FSR* is feasible. However, according to Fig. 2.7-1 in the fist version of *FSR* made in 2005, which shows the type scheme of Lengshuijie Bridge type scheme, No. 3 bridge mast of the bridge is located in the riverway of Lengshui River, which may block the river discharge after the completion of the bridge; at the same time, the bridge mast would always suffer the scour of the water in the river, which may cause the shatter of the bridge foundation, the collapse of the bridge and so on. In the project evaluation meeting in March 2015, the delegation of World Bank and EIA expressed their requirement for further verification and optimization of the design, and remove No. 3 bridge mast from the river, so as to avoid accidents. According to the requirements of this meeting, *FSR* work unit and the owner shall again go to the scene for reconnaissance, verification, and design optimization. The location of original bridge is moved upper by 4.5 m, and No. 3 bridge mast is removed from to the shore in this design (see Fig. 7.2-2). Therefore, this scheme is considered to be feasible according to this evaluation.

Table2.7-1 Scheme comparison of Lengshuijie bridge type

Lengshuijie bridge	**Recommended scheme (4-16m hollow slab bridge)**	**Compared scheme (2-30m box beam bridge)**
Structure	Good	Good
Appearance	Good	Good
Construction	Simple	Just so so
Construction period	Short	Shorter
Maintenance	Easy	Just so so
Cost	Low (RMB 3.2 million)	Lower (RMB 4.16 million)
Last choice	Recommended	Not recommended

2. Qinglongju Bridge in Sinan County

Qinglongju Bridge is located at a point on the road between Sishi and Shuidong in Tangtou Town of Sinan County. The object is a new bridge, 40 m long and 7 m wide, with 1-30 m reinforced concrete box beam. The recommended location is at Zhulinge, Xiaoxihe River. The layout charts of bridge type and site are shown in the attached Fig. 2.7-5 and Fig. 2.7-6; Fig. 2.7-7 shows the schematic diagram of Sinan Qinglongju Bridge location comparison. According to the comparison and selection scheme, it is 40 m long and 7 m wide, with 1-30 m reinforced concrete box beam, located at a the Xiaotieqiao, Xiaoxihe River, which is a simple small original iron bridge for temporary passage. The layout charts of bridge type and site are shown in attached Fig. 2.7-6. Fig. 2.7-4 shows the photo of its current status in detail. Two bridge sites are compared in the FSR of this project, the comparison results are shown in Table 2.7-3. The newly chosen location at Zhulinge is recommended. According to the site survey and research, the bridgehead of the bridge to be built in Zhulinge will occupy part of the young cedar forest, bamboo forest, and so on. Besides, some new land will be added, with a span greater than that of the iron bridge, which has a relatively bigg influence on the ecological environment; however, as the bridgehead construction needs the road close to next to a few households of villagers according to the iron bridge scheme, the traffic noise, dust, exhaust gas and so on will have certain influence on the villagers after the completion of the bridge, while it can be avoided if the bridge is chosen to be located in Zhulinge; moreover, the road there already has crackings, possible geological hazards such as collapse may happen, the geological condition is poor. According to the opinions of the villagers at the scene, newly chosen Zhulinge bridge site is more supported than the Iron Bridge site. In addition,

as the proposed Qinglongju Bridge is located at Longdijiang scenic area -- over Xiaoxihe, the iron bridge is close to the surface of Xiaoxihe, although there has been no shipping requirement recently, it has a certain influence on the navigation for future tourism projects such as the development of cruise ship in this region.

Table 2.7-2 Scheme comparison of Sinan Qinglongju bridge location

Qinglongju bridge	Recommended scheme (Zhulinge)	Compared scheme (small iron bridge)
General requirement	Best	Just so so
Hydrology	Better	Better
Landform	Good	Just so so
Geology	Good	Worse
Navigation	No navigable requirement	No navigable requirement
Masses' opinion	Higher support rate	Little support rate
Investment	RMB 2.8 million	RMB 2.85 million
Last choice	Recommended	Not recommended

In conclution, the Zhulinge scheme proposed in the FSR of this project is better than the Iron Bridge scheme. Therefore, this evaluation holds that this scheme is basicly feasibleall and agrees the recommend scheme. Nevertheless, the management must be strengthened in the process of construction. It is prohibited to destroy the existing natural landscape of Xiaoxi River, transplant trees such as cedar trees at the bridgehead, to reduce the damage to the ecology. The bridge should be designed in coordination with the natural landscape of Xiaoxi River so that it can be a new and beautiful sight over Xiaoxi River in Longdijiang scenic area.

2.8 Capacity Building

Capacity building mainly includes domestic training and overseas investigation, covering project management, contract management, maintenance management, financial management, planning of road network, maintenance technology, and so on.

1. Purpose of training

Rural road is one of the public infrastructures, directly concerning countryside, agriculture and farmers. It is significant and plays an important role in the aspects of prospering rural economy, promoting rural social progress, realizing agricultural modernization, speeding up urbanization of rural areas, helping farmer's work, and expand farmer's horizon. With the rapid development of Tongren's urban and rural

roads, sustainable traffic development and integrated road network have become the priority among priorities of Tongren government in the course of making great efforts to establish circular economic and eco-civilized city and to create harmonious society.

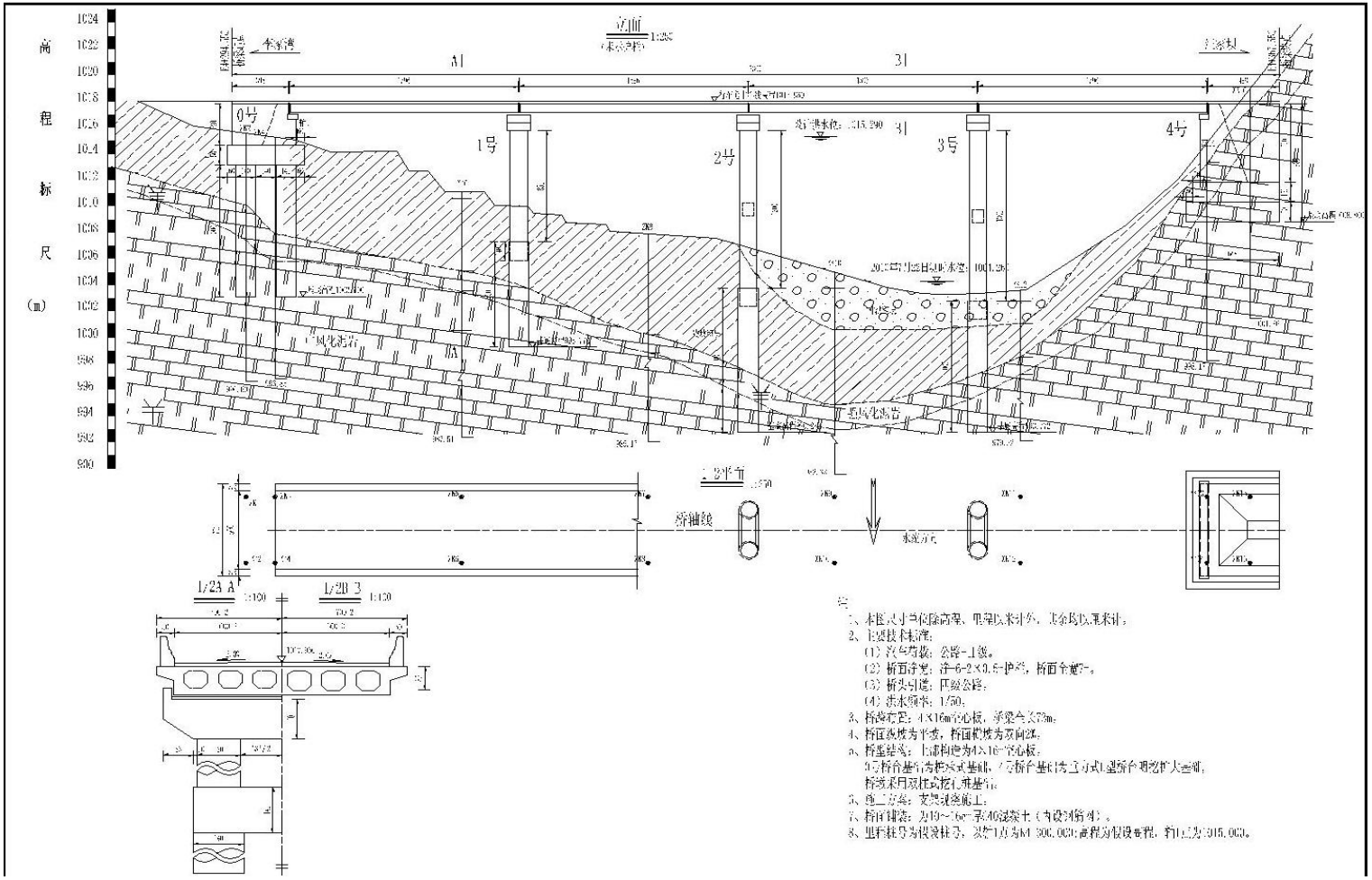


Fig. 2.7-1 Dejiang Lengshuijie Bridge type scheme 1

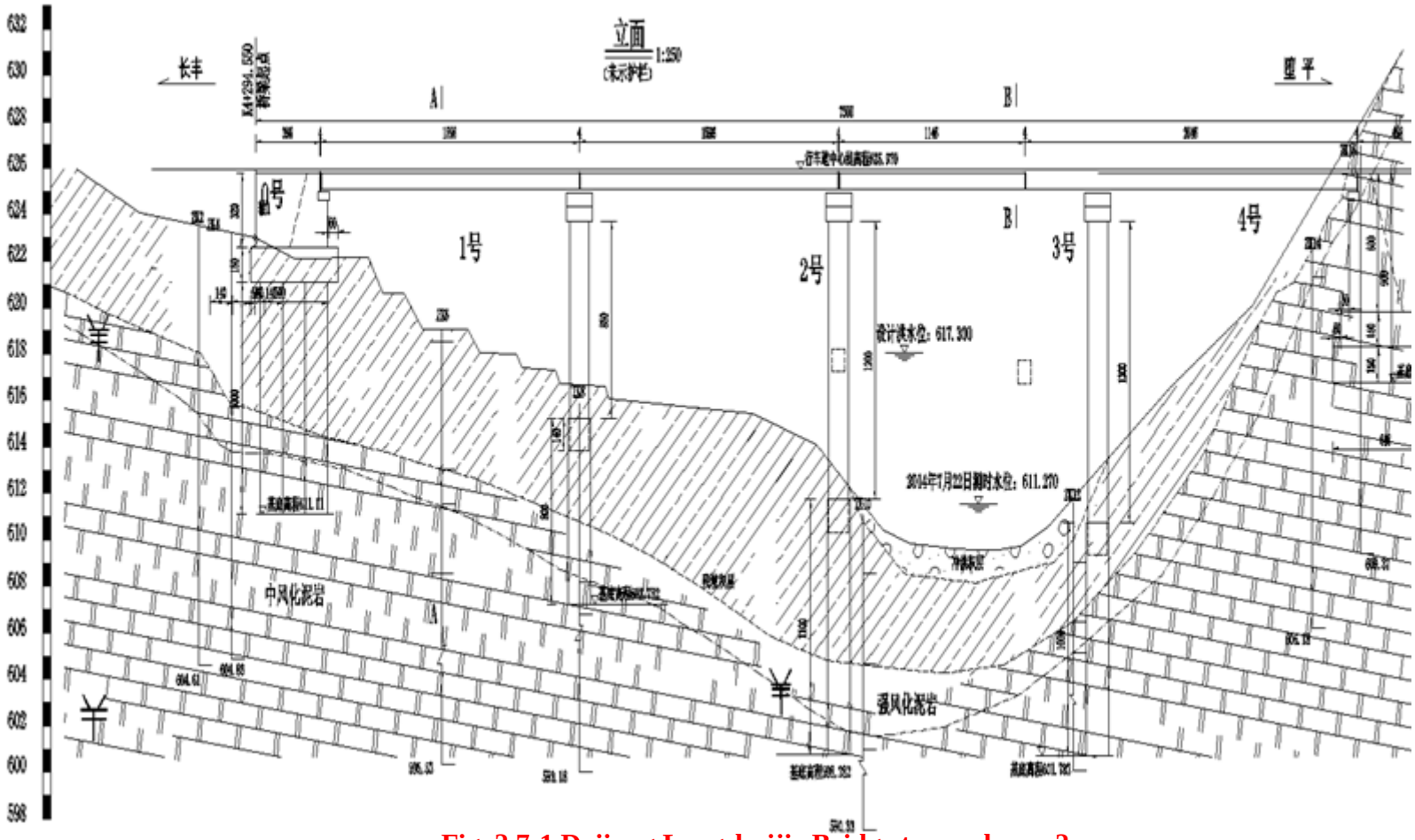


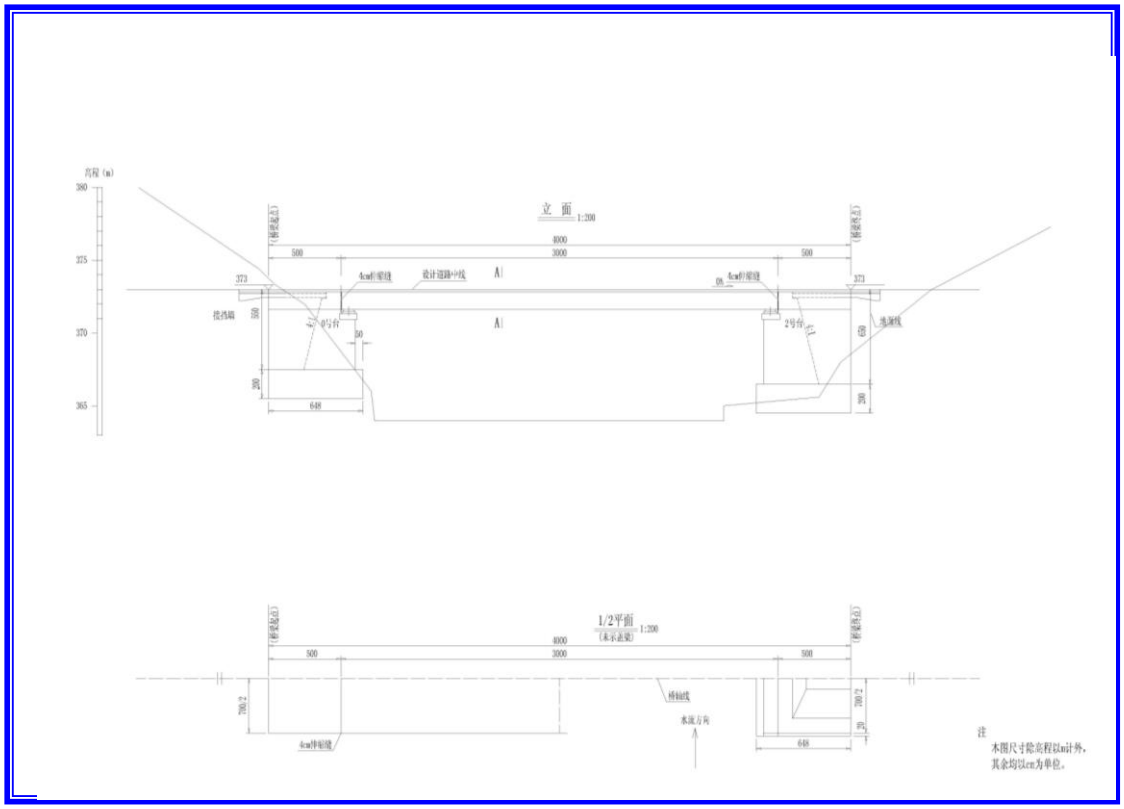
Fig. 2.7-1 Dejiang Lengshuijie Bridge type scheme 2

Fig. 2.7-3 Photo of Lengshuijie bridge

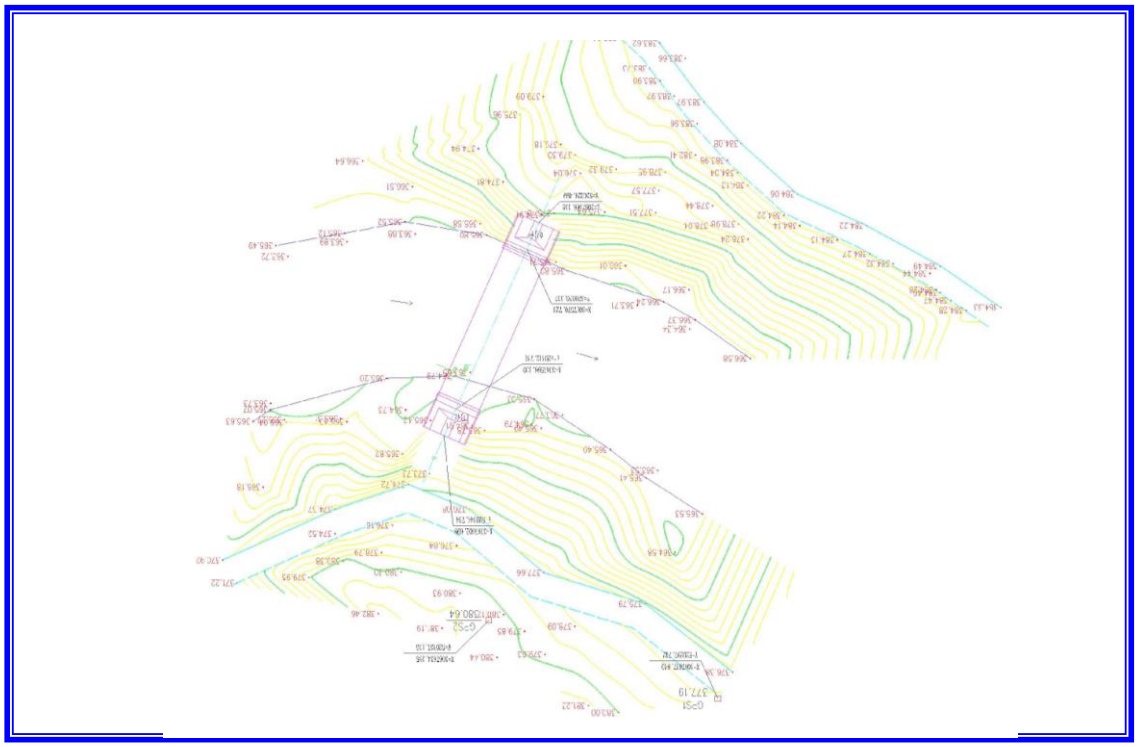
(1) Recommended location of Qinglongju bridge

(2) Current situation of original iron bridge

Fig. 2.7-4 Photo of Sinan Qinglongju bridge

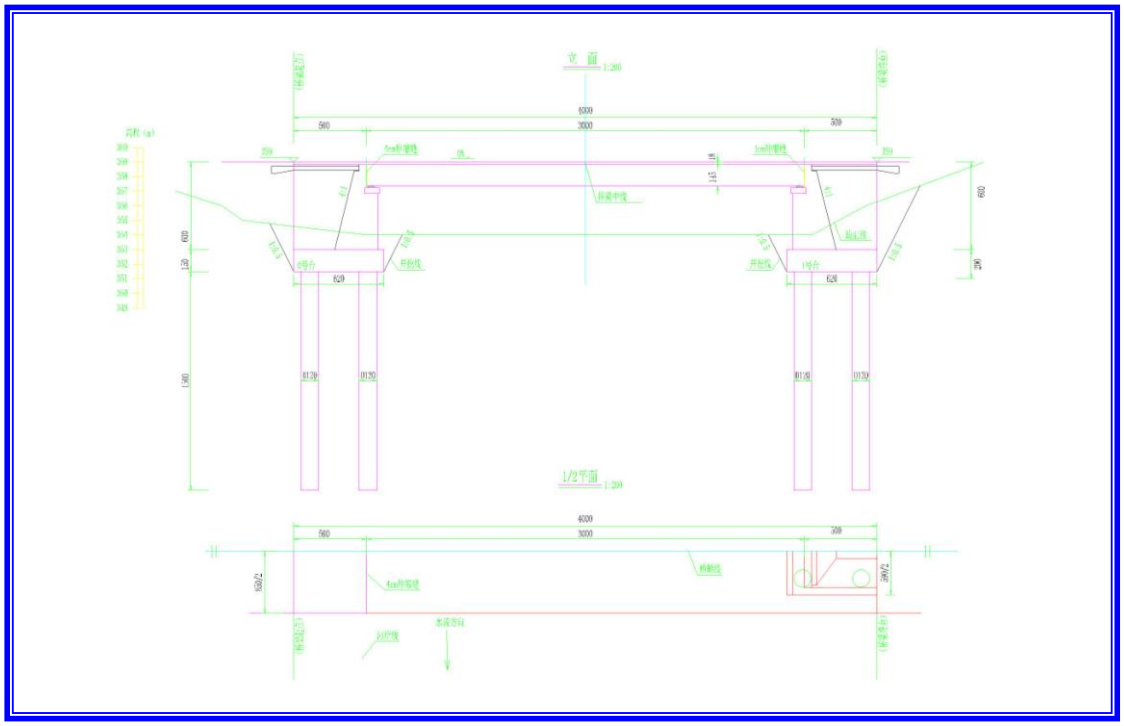


(1) Chart of bridge type



(2) Chart of bridge site

Fig. 2.7-5 Layout chart of Sinan Qinglongju bridge type, bridge site at Zhulinge



(1) Chart of bridge type

(2) Chart of bridge site

Fig. 2.7-6 Layout chart of Sinan Qinglongju bridge type, bridge site at the iron bridge

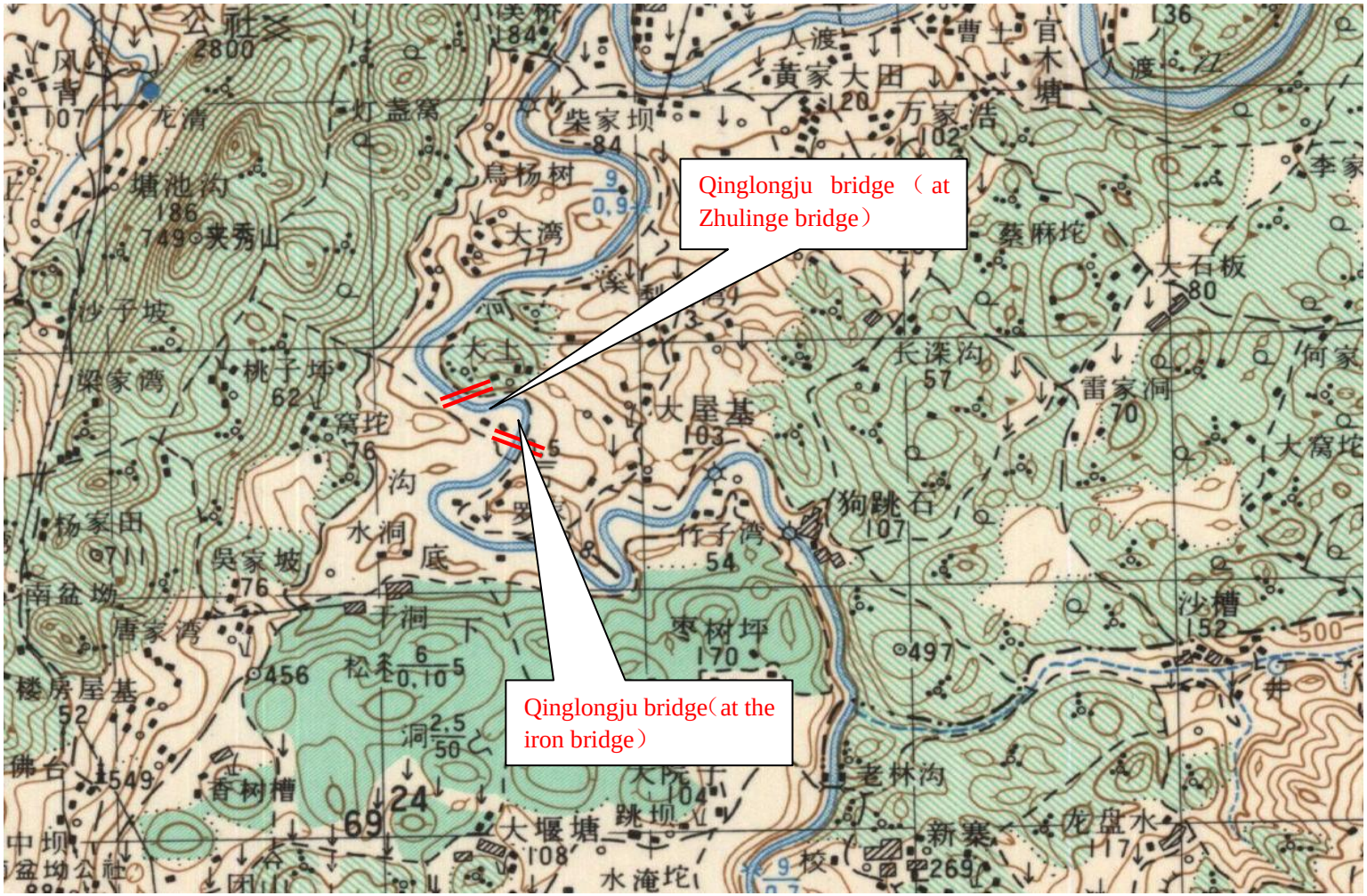


Fig. 2.7-7 Schematic diagram of Sinan Qinglongju Bridge location comparison

Experiences and lessons will be drawn from other rural road projects and make investigation on project management and engineering management. So we hope to further improve the ability of all functional organization and executive institutions related to the project, broaden cognitive domain, understand advanced concept and practice from developed cities and countries, learn new knowledge and attend high-quality training.

As one of the important contents of capacity building subproject, Tongren PMO will aim at different subjects, contents, personnel and purposes to arrange short-term overseas and domestic training.

Training arrangement

According to the plan，there will be overseas trainings and domestic trainings. The participants mainly include administrative and technical staff from the functional departments of development and reform, finance, traffic, and the project executing and implementing organizations of Guizhou Province and Tongren City, as well as from the districts and counties (cities) related to the project. Training and investigation will be carried out in batches and the specific time will be drawn up in accordance with national and local policies and standards.

2.9 Investment estimation and fund raising

The proposed project needs a total investment of 1.445586 billion yuan, including World Bank loan 930 million yuan (about 64.33%) and domestic fund 515.586 million yuan (about 35.67%).

2.10 Conform to the relevant plans

2.10.1 Cohere with the *Developemt Plan for the Transportation in Tongren*

According to the *Developemt Plan for the Transportation in Tongren*，during the "12th five-year" period, Tongren will stick to the economic development led by traffic, depend on the construction of national and provincial major traffic infrastructure and focus on express railway and expressway to strengthen the construction of major roads to outside and municipal traffic network, improve the comprehensive service ability of transportation, quicken the formation of a convenient, safe and matched modern comprehensive traffic transportation system and strive to build Tongren into an important land traffic connection for entering and exiting East Midland district from southwest region.……**(1) Plan of Highway Network：**The emphases are on: the success construction of Hang (zhou) Rui (li) highway Tongren section, Song (tao)

Cong（jiang）highway between Tongren and Dalong, Yan (he) Rong (jiang) highway Jiejian River section of Shiqian in Sinan, the section along river to Dejiang of the Yan (he) Rong (jiang) highway, and Song (tao) Cong（jiang）highway between Daxing and Yajia; striving for the construction of Jiang (kou) 6 (Panshui) highway Jiangkou to Shiqian section, Dejiang to Xishui highway Tongren section; striving for the entrance of projects such as Yanhe to Youyang highway Tongren section, Tongren to Zhangjiajie highway Tongren section, Tong (ren) to Huai (hua) highway Tongren section into provincial planning, to realize the objective of roads in each county and break the bottleneck of external transport; acceleration of the connection construction of highway and trunk highway, to improve the ability of interconnection and interflow and form a highly efficient and convenient highway network; implementation of a batch of trunk highway, tourist highway and industrial highway projects; striving for the construction of across-river bridge projects such as Tongren Shuijingge Bridge, Zhaigui Bridge, Mayan Bridge, Nanyue Bridge, Yanhe Wujiang 3rd Bridge, Sinan Wujiang 3rd Bridge, and Yuping Wuyanghe Bridge; upgrade of the exit roads of the cities; acceleration of the rural road construction and improvement of the level of rural highway, to realize internal unobstructed flow; construction of the 2-hour highway ring from Tongren to cities such as Huaihua, Kaili, Qianjiang, and Jishou , as well as the 4-hour highway ring from Tongren to cities such as Guiyang, Changsha, and Chongqing through hard work; an increase of 600 km highway, launch and implemention of oil-way projects to connect the towns and villages, as well as new construction and transformation of 10000 km rural oil-ways, to realize 100% of roads connecting towns and 100% roads connecting villages with the latter having a coverage rate of 70%, so as to preliminarily form a fast and smooth highway network and achieve the objective of fast outside and smooth inside highway network during the “12th five-year” period. As a result, the implementation of this project is in conformity with the *Developemt Plan for the Transportation in Tongren*.

2.10.2 Cohere with the *Developemt Plan for the Rural Road in Tongren*

According to the *Developemt Plan for the Rural Road in Tongren*，Tongren rural road development should focus on "consolidating achievements, perfecting facilities, improving abilities, and realizing a coordinated development" during "12th five-year".

"12th five-year" Tongren rural road construction goal is to further perfect the

rural road infrastructures in the whole city, obviously increase the proportion of asphalt (cement) road construction for connecting the villages, strive to achieve a 70% coverage of asphalt (cement) road, further facilitate the peasants, improve the rural road maintenance management system and supporting service & facilities, optimize highway traffic network, greatly enhance anti-disaster ability and service level, at the same time, further develop passenger transport system, meet basic transportation requirements, link the urban and rural public transportation resources, and gradually form a convenient rural passenger transport network covering urban and rural areas by the end of the "12th five-year".

There are three stages specificly: the first stage contains "capacity" and "patency" tasks. On the basis of *2020 National Rural Highway Development Planning Objectives*, 100% of asphalt (cement) roads connecting villages and towns as well as 100% of roads connecting villages will be finished to complete the capacity task and basic roads connecting villages by 2015. Unobstructed asphalt (cement) roads (over 62% in Dejiang, and over 56% in Sinan averagely) shall be basically realized and then smoother roads with higher technical indicators be built by the end of the "12th five-year". The second phase contains rural road reconstruction, improvement and construction tasks, including unsafe bridge reconstruction, security engineering, disaster prevention and control, and new bridges on existing roads, etc., to raise the anti-disaster ability and safety level of the rural roads. The third phase is to optimize the rural road network construction project, including road reformations in counties and towns, connecting engineering, and so on, to improve the networked level of the rural roads and the overall service capacity. As a result, the implementation of this project is in conformity with the *Developemt Plan for the Rural Road in Tongren*

2.10.3 Cohere with the *Developemt Plan for the Transportation in Dejiang*

According to the *Developemt Plan for the Transportation in Dejiang*，during the “12th five-year” period, Dejiang will stick to the economic development led by traffic, depend on the national and provincial major traffic infrastructures, focus on express railway and expressway to strengthen the construction of major roads to outside and municipal traffic network, improve the comprehensive service ability of transportation, quicken the formation of a convenient, safe and matched modern comprehensive traffic transportation system and strive to build Dejiang into a regional traffic hub and

central city on northeast Guizhou, strive to form the road network for land, sea and air of the frame of “three highway, four rail way and one airport”, and seize the opportunities of the construction of highway, railway and rural road networks implemented by the nation, to further quicken the construction of triadic network focused on highway, railway, airport and inland water transportation during the period between “12th five-year” and 2020,.

2.10.4 Cohere with the *Developemt Plan for the Transportation in Sinan*

According to the *Developemt Plan for the Transportation in Sinan*, during the period of “12th five-year”, Sinan will stick to the policy of “overall planning and appropriate advance”, focus on promoting the level of networking and modernization, to seize the major opportunity of strengthening the infrastructure construction of the Party Central Committee, as well as provincial and municipal government and try to quicken the construction of the water and land traffic hub system at the middle and downstream of Wujiang River, urban and rural water supply security system and electric power system, to enhance Sinan County infrastructure conditions in a short term and the ability to support and guarantee capability for the long-term development.

"One port, one tunnel, two highways, three railways, four bridges, five links" will be constructed. "One port" refers to (Qian northeast hub port in Sinan); "One tunnel" refers to (Shoulayan tunnel on Songfeng line of S304 provincial road). "Two highways" refers to (Hangrui highway and Sijian highway, thereof, Hangrui highway Sinan to Zunyi section 22.8 km within Sinan, Sinan to Daxing section 15.8 km within Sinan, Sinan to Jianhe highway section 36.8 km within Sinan); "Three railways" refers to (Qianjiang to Zhaotong railway, Guiyang to Zhengzhou railway, Chongqing Wansheng to Guangzhou express railroad); "Four bridgeS" refers to (Wenjiadian Wujiang Rver Bridge, Tongjing Wujiang River Bridge, Baiyang Bridge, Liuchihe Bridge); "Five links" refers to (Shagou interchange of Hangrui highway from Changba Stone Forest to Shiqian Benzhuang secondary road; Tangtou interchange of Sijian Highway to Changba Stone Forest; Shuangtang interchange of Sijian Highway from Yingwuxi Spring to Shagou interchange of Hangrui highway; east Sinan interchange of Hangrui highway to Tenglong interchange of Sijian highway; Tangtou interchange of Sijian Highway from the overbridge to Xiaoyun interchange of Hangrui highway)

At present, two (three sections) expressways have been completed and open to

traffic in Sinan. It is now speeding up highway construction, striving to complete the upgrading and reconstruction of trunk highways of G211, S203, S204, S304 and S305 passing through Sinan County to form an effective and convenient highway network by 2020, reconstructing and upgrading the exit road of the city, speeding up the rural road construction to improve the level of rural roads and realize unobstructed internal flow, implementing road projects connecting the counties and towns as well as oil-way projects connecting the villages to realize 100% asphalt roads in villages and towns with an oil-way coverage rate of 100% and form a fast and smooth highway network preliminarily to achieve the objective of fast outside and smooth inside highway network.

The implementation of the proposed rural highway project in Tongren will make the highway network layout more reasonable, which has important significance for improving the high-grade highway network in this region, giving full play to the overall benefit of highway network, and promoting the economic development along the project line. In addition, the implementation of the proposed project is conducive to the perfection of the rural highway network layout of Tongren city, even Guizhou province, rapid and coordinated urban and rural economic development, and construction of socialism new countryside.

3 Environmental profile

3.1 Natural conditions

Tongren rural road project in Guizhou province financed by the World Bank loan is located in Dejiang County and Sinan County of Tongren City in Guizhou Province.

3.1.1 Tongren City

1. Geographical location

At 107°45′～109°30′E and 27°7′～29°5′ N, Tongren City is located in the northeast of Guizhou Province adjacent to Xiangxi autonomous prefecture and Huaihua city in Hunan Province, Xiushan, Youyang and Pengshui in Chongqing and Southeast Qian and Zunyi City in Guizhou Province. It is the bridgehead for the southwest to connect the central and eastern developed regions, known as the "Door of East Guizhou". With a land area of 18000 km², it accounts for 10.22% of the provincial land area; the municipal government of Tongren is Bijiang District, and there are Bijiang District, Wanshan Special District, Jiangkou County, Sinan County, Dejiang County, Songtao Miao Autonomous County, Yuping Dong Autonomous County, Yinjiang Tujia and Miao Autonomous County and Yanhe Tujia Autonomous County. By 2012, the total population is 4.20 million. The geographical position of Tongren City in China and Guizhou is shown in Fig. 1.1-1.

2. Landform

Located in the slope zone transiting from the Yunnan-Guizhou Plateau to Xiangxi hills and Sichuan Basin, Tongren City has an altitude between 500 m and 1000 m. Fenghuang Mountain in the southeast of the main peak Fanjing Mountain in Wuling Mountains has the highest altitude of 2572 m, and Xiashitan in east Bijiang zone has the lowest altitude of 205 m. Due to the complex geological features and relatively big ups and downs of the terrain of Wuling Mountain in the Western area, the underground and geoclimatic components have complex diverse characteristics. Tongren is mainly covered by mountains. Because of a great exposure of carbonate rock stratum, each county, city, and special administrative has a different karst landform developme with different coverages amd scales. It is full of grikes and clints. Stone forests, peak clusters, canyons, depressions, karst caves, funnels, underground rivers, and so on can be commonly seen.

3. Climate

Located in the slope zone transiting from the Yunnan-Guizhou Plateau to Xiangxi

hills and Sichuan Basin, Tongren City is of subtropical monsoon climate, of which the characteristics are mainly shown as of obvious monsoon climate, significant vertical climate difference and the obvious seasonal changes of main climate elements. There is abundant rainfall and the changes of light, heat and water are basically synchronous for facilitating the crops to make full use of light energy and providing favorable conditions for high yield to crops. The annual average temperature is 13-17.5℃; the average annual rainfall is 1100-1400mm; the frost-free period is 200-300d. The daily average temperature is 10 ℃ or higher and the accumulated temperature is 3000-5700℃. The annual sunlight hours are 1085-1324h, accounting for 25-30% of duration of possible sunshine.

4. Rivers

Hydropower resources in Tongren are abundant. Ruanjiang and Wujiang river systems are the two main systems, see attached Fig. 3.1-1. The total annual runoff volume of all the rivers in the city is 12.79 billion m3, with a hydropower resources reserve volume of 3.26 million KW. The two large hydropower stations Shatuo and Silin Station all have more than 1 million KW; Silin Hydropower Station has completed the damming of the great river. Dalong Heat-Engine Plant with a short-term power of 600 thousand KW and long-term power of 3 million KW is under construction. The first unit of 300 thousand KW has been put into operation. Tongren will gradually become the major source for "electricity deliver from Qian to the east". There is abundant precipitation, high density of rivers on the surface, and lots of underground supply base flow. The total annual runoff volume of all the rivers in the city reaches up to about 12.8 billion m3 (including surface runoff of 9.56 billion m3, underground water reserve of 3.23 billion m3). Per capita water in Tongren is 3671 m3, which is ranked first in the province. In addition, foreign water passing through Tongren is very rich, with an annual runoff as high as about 32.8 billion m3, providing favorable conditions for social production and people's life. Thanks to the dense forest, good surface coverage, clear water, low sediment concentration, most water source can realize self-purification under mild contamination. In terms of hydroenergy, as a result of the higher ground of various rivers, big river slope, and good water power resources, the city has a theoretical water reserve of 937 thousand KW, therein, exploitable power 399.7 thousand KW, accounting for 42.6% of the theoretical value. If the cascade hydropower resource of Wujiang is added in, the

city's theoretical water reserve can reach up to 2.0374 million KW, and the exploitable amount 584.3 KW. Per capita exploitable value is up to 430 w. Both above the average level of the whole nation and province.

5. Biological resources

Due to its rich light, heat, water and soil resources as well as appropriate topography, Tongren provides good natural conditions for biological symbiosis and breeding. Plant resources in Tongren are mainly divided into five major categories, namely forest plants, grass, medicinal plants, crop varieties and fruit varieties; animal resources mainly include three major categories varieties, namely livestock and poultry, aquatic animals, and wild animals.

(1) Plant resources

The first is the forest resource. It has a total of 627 tree species, belonging to 89 families, and 627 genera. Most are timber forest and economic forest, while firewood forest, shelter forest, bamboo forest, forest for special use account for a small proportion. Lots of forest tree species have been listed as national rare and endangered plants, including the state-level Grade I key protection plants: davidia involucrata and crape myrtle, Grade II protection plants: clock calyx wood, cercidiphyllum, and liriodendron tulipifera, as well as Grade III protection plants: amentotaxus, kanasugi maple, magnolia bark, magnoliaceae, ormosia henryi, nanmu, pterostyrax psilophyllus, Lijiang hemlock, Chinese hemlock, paragonimus bract hemlock, and so on. Most rare and precious tree species concentrate in the nature reserve of Fanjing Mountain. The second is grass resource. Native grass can be divided into 6 major categories in general, with a total of 160 species, namely 74 species of the gramineae grass, 16 species of legume forages, 38 species of weeds, 3 species of aquatic green class, 4 species of feeding tree, and 25 species of forage cane shrubs. The third is medicinal material resource. There are more than 500 species of medicinal plants,

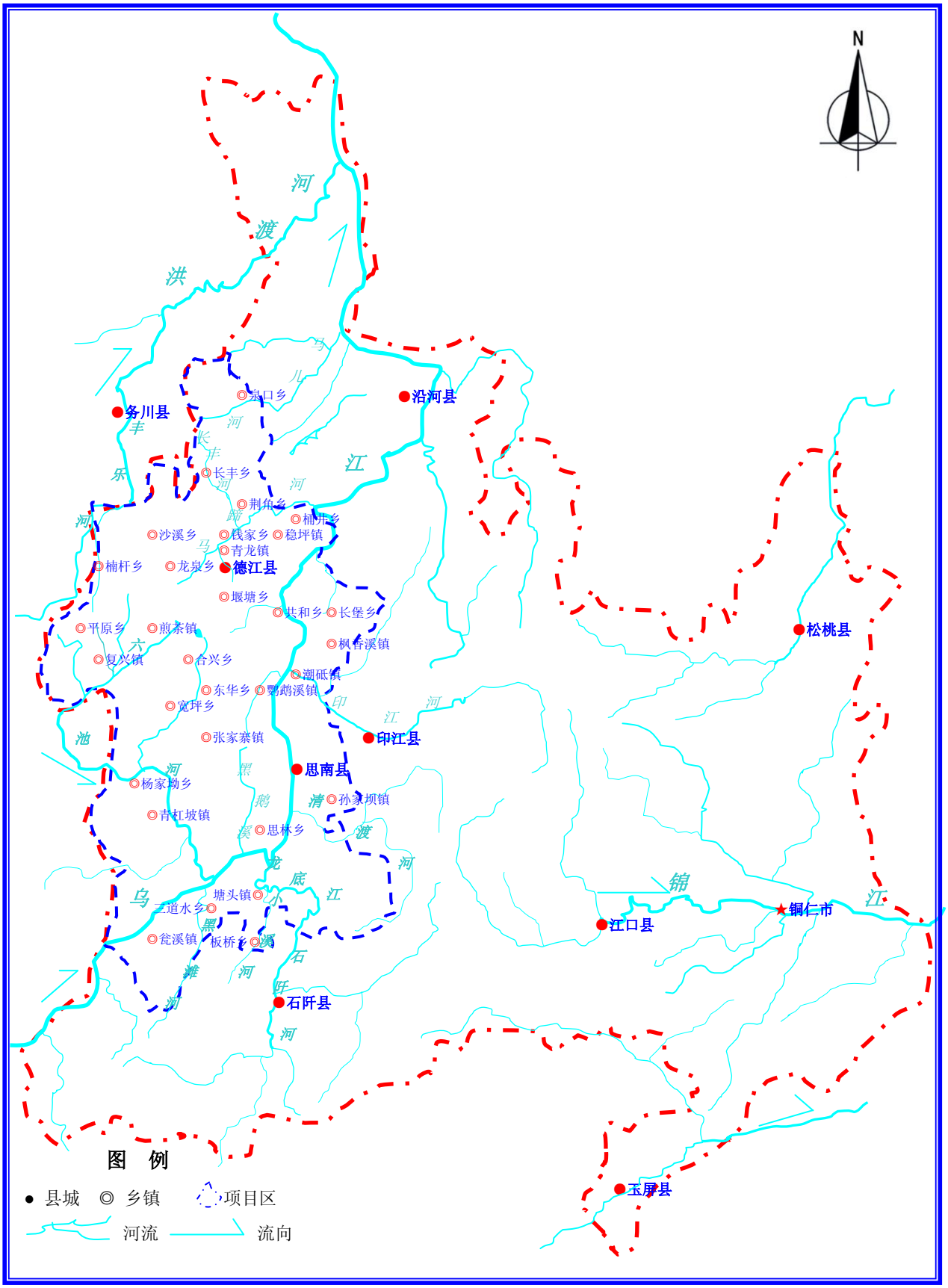


Fig. 3.1-1 Regional drainage map in the project location

therein, those have accurately identified have 100 families, 227 genera, and 413 species, including 96 species of heat-clearing and detoxicating plants, 44 species which can suppress coughing, eliminate phlegm, and ease breathe, 43 species of hemostatic medicinal plants, 60 species which can get rid of rheumatism, relax the muscles and stimulate the blood circulation, 33 species which can tonify middle-Jiao and Qi as well as fend off the cold, and 95 species with other functions. In addition, the folk common plant medicines popular both inside and outside the province include rhizoma panacis majoris, rhizomatum, shelian, ardisia crispa, creat, berberis, top ten credit plants, and so on. Plant medicines with relatively large output include mo dogwood, eucommia bark, mangnolia officinalis, cortex phellodendri, gallnut, flos lonicerae, fructus trichosanthis, rhizoma belamcandae, pinellia, gastrodia elata, and so on. There are also very rich large fungi in this area, including 33 families, 77 genera and 151 species. Among them, 21 species such as tabasheer, ganoderma lucidum, tuckahoe, and wubo can be used as medicines. There are 12 species which contain anti-cancer substances or anti-cancer effects, such as basidiomycetes and russula vesca. Besides, 30 kinds such as mushroom, black fungus, and pine mushroom are delicacies widely loved by urban and rural residents. The fourth is farming plant resource. Cultivated plants mainly include food crops, oil crops, as well as other economic crops and vegetables, with a total of 812 local varieties. Thereof, food crops mainly include 594 varieties such as rice, corn, potato, wheat, beans and grains, oil crops mainly have 11 varieties such as oilseed rape and peanut, other economic crops mainly have 53 varieties such as tobacco, piemarker, sunflower, tea, and silkworm, vegetables mainly have 13 categories such as leaf vegetables, root vegetables, solanaceous fruit, cabbage, bulbs, aquatic vegetables, cucurbites, and wild vegetables, with a total of 154 varieties. The fifth is fruit tree resource. Cultivated fruits in this area mainly include citrus, orange, grapefruit, peach, plum, pear, apricot, persimmon, jujube, apple, grape, chestnut, loquat, and so on. There also are various and abundent wild fruits with rich nutrition in the mountainous area such as kiwi fruits, cactus pears, red seeds, stauntonia latifolia and so on. In recent years, the artificial cultivation of kiwi fruits has been gradually popularized.

(2) Animal resources

The first is the livestock and poultry breed resource. Livestock mainly includes pigs, cattle, sheep, and dogs. There are also a small amout of horses, donkeys, rabbits, and so on. Poultry mainly includes chickens, ducks, and a small amount of geese and pigeons. In recent years, the feeding of wild birds and rare birds such as heasant and blue peacocks has been more noticed. The second is the aquatic animal resource. Fish takes up a major part of aquatic animals, with a total of 5 orders, 16 families and 93 species. Most species are lithium, sisoridae and serranidae. In recent years, the artificial breeding of eel has been more noticed. In addition to fish, there also are amphibians such as giant salamander and frogs, reptiles such as turtle and shelled turtle, mollusks such as clams and screw, as well as arthropods such as Japanese spermatogenesis and exopalaemon modestus. Giant salamander is also called as "landscape treasure" in the world. It belongs to the national Class Ⅱ protected animal. Its major production area is in this area, with several minor ones scattered around the counties, especially Fanjing Mountains and its surroundings. Also known as "Trionyx sinensis" and "soft shelled turtle", shelled turtle is a senior nourishing animal, with fresh and scented meat quality. Its carapace can be used as medicine, mainly to deal with illnesses such as Yin deficiency, tuberculosis, overheat and disease accumulation. It can be found in many water areas such as brooks, rivers, ponds, reservoirs, and moors, which are the high production areas of the shelled turtle. The third is wildlife resource. There are about more than 400 species of wild animals wthin this territory, including 60 species of mammal animals such as the national Class I protected animals Qian golden monkey and francois' langurs, national Class II protected animals such as assamese macaque and macaca speciosa, national as well as Class III protected animals such as forest musk deer, elaphodus cephalophus, and pangolins. Qian golden monkey is also called as gray golden monkey and snub-nosed monkey. As only Fanjing Mountains in this city have this kind of monkey in the world, it is a very rare and endangered species; Francois' langurs are mainly distributed in Mayanghe national nature reserve in this city. Amphibians within this territory are divided into 2 orders, 8 families and 11 genera, including about 40 species. In addition to giant salamander, rare amphibian animals also include other 4 species, namely spot-tailed warty newt, rana

ashena, mixtured pygmy frog, and megophrys spinatus. Reptiles are divided into 3 orders, 8 families, 23 genera, and about 50 species, including 32 species in snake order, 7 species of poisonous snake, and 13 species with high medicinal value and edible value. Birds are divided into 16 orders, 35 families and about 200 species, including around 65% breeding birds such as stationary birds and summer migratory birds, around 35% non-breeding birds such as winter migratory birds and passing migrant birds, as well as 4 species of national protected rare birds, namely mandarin duck, temminick's tragopan, reeves's pheasant and chrysolophus pictus. Although mandarin ducks usually breed in the north, they also breed in Fanjing Mountains, further showing the charm of the natural environment of Tongren City.

3.1.2 Dejiang County

1、Geographical location

Dejiang County is located in the northeast of Guizhou Province and westof Tongren City. The eastern longitude is 107°46'～108°25', and its northern latitude is 28°00'～28°38'. It connects Yinjiang County in the east, Sinan County in the south, and Fenggang County in the west, and lies between Wuchuan and Yanhe counties in the north.，see Fig. 1.1-1. It is 63.68 km long from west to east, and 78.88 km wide from north to south, with a circumference of 370.33 km and a total area of 2071.92 km^2. The county is 179 km away from Zunyi City, 342 km away from Guiyang City, and 262 km away from Tongren City. According to the national and Guizhou Province development planning, there will be three highways, five railways, and a port to meet in Dejiang during the period of "12th five-year". Among them, Hangzhou to Ruili expressway has opened to traffic at the end of 2013, Qiuyang to Rongjiang expressway is under construction, the constuction of Dejiang to Xishui expressway is going to be put into operation soon, the preliminary construction works of 5 railways including Zhaotong to Qianjiang section, Duyun to Qianjiang section, Qianjiang to Hekou section, Chongqing to Guangzhou section, and Zunyi to Jishou section have been going well, as well as Dejiang port for Wujiang river shipping of 800 thousand t level will be completed this year. With the gradual constructions of "three highways, five railways, and one port", Dejiang will become

a hub city with convenient land and water transportation system.

2. Topography, geomorphology, and geology

Located in the south of the mountain plateau in northeastern Guizhou, Dejiang County is within Qian Dejiang County and the border area of Dalou Mountain System and Wuling Mountain System. The terrain along this border has relatively large ups and downs. In general, it is higer in the west than in the east, with a highest altitude of 992 m and lowest altitude of 300 m. With many mountainous, hills, deep valleys, steep terrains, and large natural gradients, this project zone is a typical heavy-hilly area, belonging to the denudational landform. Dejiang County is located in the fold belt of Guizhou. Its outcropped strata contain Cambrian system, Ordovician system, Silurian system, Permian system, Triassic system and part of Quaternary system from the earliest to the latest. The total thickness is about more than 3500 m, thereof, soluble rock exposure accounts for about 70%.

3. Climate and weather

Characterized by obvious monsoon climate, this area belongs to subtropical monsoon climate, with abundant heat, mild climate, sufficient rainfall, light and water in hot season, as well as long frost-free period. According to the data from the weather station of Dejiang County, the annual average temperature is 16.0 ℃, with an average temperature of 4.9 ℃ in January, 26.3 ℃ in July, the extreme maximum temperature of 41.2 ℃, extreme minimum temperature of 8 ℃, frost-free period of 295 days, annual average rainfall of 1239.8 mm, annual average sunshine hours of 1069.8 hours, relative humidity of 81%, and the dominant wind direction N.

4. Hydrology and water system

The rivers in Dejiang County belong to the Yangtze River basin system of Wujiang drainage basin, as shown in the attached Fig. 3.1-1. Dejiang County has a total of 178 big and small rivers, including 31 rivers with a drainage basin of over 20 km^2 and length of over 10 km. The total length is 548.7 km, drainage density 23.5 km per square kilometer, and average flow rate 45.4 m^3/s for many years (excluding guest water). Most rivers run from northeast to southwest, with relatively large slopes and obvious watersheds. According to the destinations of the rivers, they are divided into six drainage basins, namely Mati River, Fengle River, Chuanyan River, Lengshui

River, Ma'er River, and Wujiang main stream.

Mati River: Except for Wujiang main stream, it is the biggest river in Dejiang County and first grade level tributary at the left bank of the downstream of Wujiang water system of the Yangtze River basin, originating from Tanjiashan in Huangnixi, Longquan Town, Dejiang County, with an elevation of 1252.0 m, running through Wenxin, Guanyintan, Matixi, Jingjiao, Xinkengba, Shuitongkou and Wangpai eastward along Dejiang County and YanheTujia autonomous counties into Wujiang at Shuanglongchang on the boarder of the two counties with an estuary of 322.0 m. The catchment area of Mati River is 730.34 km^2, drainage line 57.0 km long, average slope 7.6 ‰, and average flow rate 16.78 m^3/s. The main rivers that go into Mati River from the top down in turn are Tangba River, Banqiaogou River, Yuxi River, Guanzhuang River, Jiaokou River, Shanshu River, Laogouxi River, Chagnfeng River, Xiaoxi River, Wenping River, and Liaojia River, with the former seven in Dejiang County and Liaojiahe in Yanhe County.

Wujiang main stream and its tributaries: It enters from Tongjing in Sinan County, runs through places such as Maixiexi, Chaodi, Longqiao, Yanghe, Changbao, Baiguotuo, Muye, Xiaoping and Wenhua, and exits from Wangpai into Yanhe County. The whole length is 45 km, drainage area 409.54 km^2, and average flow rate 9.02 m^3/s (excluding Wujiang). 10 km long tributaries within the drainage area include Houxi River, Liudu River, Banqiao River, Haixigou River, Yinjiang mainstream of Shuangcha River, and Wujiang main stream, all belonging to the primary tributaries of Wujiang water system.

5. Soil and vegetation

Soil: The parent materials of soils in Dejiang County mainly include carbonate rock, clastic rocks, wind fossils, quaternary red clay, modern river alluvium, and so on. The soils in the whole county are divided into five types, 15 sub-types, 27 genera and 58 species. The soils along the planned path mainly are yellow soil, lime soil, and paddy soil. The rest scatter around.

Vegetation: Due to the influence of artificial factors, the native vegetation in the evaluation area has been damaged, leaving mainly secondary forest vegetation such as pinus massoniana forest, cypress thickets, Chinese fir forest,

and scrub-grassland grass as well as farmland vegetation such as rice, corn, canola, and vegetables. Dejiang County has a forestry land area of 67622 hm^2, including forestland 40417 hm^2, shrubbery 12014 hm^2, open forest land 3257 hm^2, immature planting area 11926 hm^2, non-forest land 4 hm^2, and nursery garden 4 hm^2, with a forest coverage of 25.38%.

Dejiang County, where the proposed project locates, is within the subtropical broad-leaved forest belt, with abundent forest, medicinal herbs, and forage grass resources. According to the statistics, there are 4689 species of vascular plants, including 48 species of aquatic vascular plants, about 120 species of ferns, about 21 species of gymnosperm, and about 4500 species of angiosperms (3000 species of dicotyledonous plants and 1500 species of monocotyledons). The plant assemblages are varied, with complicated composition. Tree species are divided into 71 families and 218 species, mainly include Pinaceae: masson pine, pinus massoniana and Yunnan pine, Taxodiaceae: cunninghamia lanceolata and cryptomeria, Cupressaceae: cedar, Sabina chinensis, juniper, arborvitae, etc. According to the data collection, investigation, and the demonstration of local Forestry Bureau, there have been no wild rare and endangered plants as well as ancient trees found in the proposed project evaluation area.

6. Animals

Due to long-term human activities, forest resources have been reduced and wild animals have become rare. Current animal resources mainly are livestock and poultry. Main wild animals include rabbits, squirrels, goats, snakes, grass carp, crucian carp, loach, eel, etc.; Livestock and poultry mainly include pigs, cattle, sheep, horses, chickens, ducks, geese, rabbits, bees, etc.; Farmed fish species mainly include: grass carp, carp, silver carp, etc. According to data collection and investigation, there have been no national protected rare and endangered wild animals found in the proposed project evaluation area.

3.1.3 Sinan County

1. Geographical location

Located in the eastern part of Guizhou Province, Sinan County is inTongren area, with its geographical coordinates of east longitude 107°52′-108°28′, north

latitude 27°32′-28°10′, as shown in Fig. 1.1-1.It is in the hinderland of Wuling Mountain, and heartland of Wujiang Drainage Area. It next to Mount Fanjin in east, which is the natural conservation area of national level, against Zunyi in west, which is the famous historic and cultural city, relies on Shiqian in south, which is the spring city, reaches to Chongqing Fuling and flows into Yangtze River along Wujiang River in north. The Tongzun arterial road traverses the county from east to west, and the golden water channel-Wujiang River passes through the county from north to south. It is the fortress of land and water transportation for eastern and northern Guizhou connects Hunan, Chongqing and Sichuan. The landscape in Sinan is beautiful, the climate is moderate and the land is fertile. The territory area to whole county is 2230.5 km². There are 13 towns, 14 national townships, 17 nationalities such as Han, Tujia, Kelao, and Mongolia. It has a population of 640 thousand. On account of the main stream of Wujiang River passes through 78.13km in Sinan County, a natural and charming scenery line is formed, Wuling Mountains and Dalou Mountains are separated and karstic feature is constituted with unique landform.

2. Topography, geomorphology, and geology

It is located at the northern edge of large slope zonetransitioning the Guizhou Plateau and the Western Hunan hills, and between the Loushan Mountain System and Wuling Mountain System. Due to different structures, lithologies and Wujiang water system, it presents many kinds of morphologies such as many Peak Mountains, mild hills, valeys, river valley, and stone forest and so on. The highest point is Zhangziyan on the southeast edge with an elevation of 1434 m, while the lowest point is the exit point of the county in the north, with an elevation of 343 m. The largest relative height difference is 1091 m. The landform belongs to hilly basin mainly covered by mountains and hills.

Sinan County is located at the western margin of the Xuefeng old land stable platform in geological structure, and is located on the Fenggang NNE tectonic deformation zone, Zunyi fault arch, north Guizhou plateform uprise. Therefore, faults and folds grow, creating the unique geological and geomorphological environment of Sinan County. It mainly presents NNE and NE tectonic system, of which the NNE structure is primary. It formed at the Phase of Yanshan, composed of the folds

arranged in roughly parallel and high-angle compression faults and presenting hinge tectonic pattern arranged in Chinese charater "Duo". These folds and faults present "S" shaped bending eastward, and tension and transtensional faults grow at the bend position, with wide syncline and narrow anticline. The folds mainly include Xujiaba syncline, Tangtou syncline and Yingwuxi anticline; the faults mainly include Daheba fault and Shiqian compression fault. The NE structure ranks second, formed before the Phase of Xuefeng, and mainly including a series of compression and scissor faults in generally parallel. This region mainly includes compression and scissor faults and Tangtou compression and scissor faults, all which are the regional great faults.

It is located at the northern edge of large slope zonetransitioning the Guizhou Plateau and the Western Hunan hills, and between the Loushan Mountain System and Wuling Mountain System. Due to different structures, lithologies and Wujiang water system, it presents many kinds of morphologies such as many Peak Mountains, mild hills, valeys, river valley, and stone forest and so on. The highest point is Zhangziyan on the southeast edge with an elevation of 1434 m, while the lowest point is the exit point of the county in the north, with an elevation of 343 m. The largest relative height difference is 1091 m. According to the geomorphic internal and external stress and the surface morphology, the landform in this region can be divided into four types, namely tectonic erosion corrosion low & medium moutains, valleys, corrosion and erosion low mountain valley, and erosion accumulation. The outcropped strata in the county from the earliest to the latest are Cambrian system, Ordovician system, middle & lower Silurian system, Permian System and middle & lower Triassic system. Triassic system and Permian System have the most outcropped strata, followed by Silurian system and Ordovician system. Quaternary system scatters around. The hidden layer contains Devonian system, Carboniferous system, Jurassic system, and Cretaceous system.

3. Climate and weather

Located in the subtropical monsoon humid climate zone, Sinan has long summer and winter as well as short spring and autumn, with gentle climate. There are a lot of rainstorms and showers in flood seasons. Downpours mostly occur in Jun and July, with the duration of 1 ~ 3 days, and big day and night temperature difference, often

forming the night rains. The average rainfall has been 1134.4 mm for many years, and the annual average temperature is 17.3 ℃, the absolute highest temperature in summer 41 ℃, the absolute lowest temperature in winter 5.5 ℃ below zero, annual relative humidity 7.6%, annual sunshine hours 1248.4 hours, relative sunshine duration 27%, average frost-free period 290 days, and perennial dominant wind south wind.

4. Water system

Sinan County is located along the midstream of Wujiang, which runs from southwest to northeast obliquely. All the brooks in this region take Wujiang as the discharge datum, covering the whole county in the shape of a network and all belonging to the Wujiang water system Yangtze River basin. In addition to Wujiang, there also are a total of 284 big and small brooks. Wujiang enters from Gaotan in the southwest of the county, runs through Wenjiadian, Wayaozui, Fengqing, Silin, Liangjiangkou, Shaojia Bridge, couty town, and Tongjing, and exits from Maixiexi in the north, with a total length of 78.13 km and width of 60-110 m. Shiqian River flows into Wujiang at Liangjiangkou, with a total length of 37 km and channel width of 5-6 m. Liuchihe flows into Wujiang at Tongkou, with a total length of 43.4 km in the county and channel width of 5 m. Besides, 18 piers with good conditions have been formed over the riverside of Wujiang and its tributaries, contributing to the smooth water transport. See attached figure 3.1-1 for detailed information.

Longdijiang: According to the proposed project, Qinglongju Bridge is located over Xiaoxi River, which is a tributary of Longdijiang. Longdijiang (other names: Longchuan River and Shiqian River) originates from Baishashiping of Shiqian, enters from Zhaojia River of Xinglong Town in the south into Sinan County, passes through Xinglong, Dayan, Daba, and Dehao of Dabachang as well as Renhe, Tangtou, Yaomin, and Bajiao of Tangtou Town, and flows into Wujiang at Liangjiangkou of Bajiao. As a tributary of Longdijiang, Xiaoxi River originates from Xiaoxi, Longtangzhen, Shiqian County, passes through Longtang and Banqiao, and flows into Longdijiang at Tangtou, with a total length of 15.6 km, natural fall of 80 m, catchment area of 219 km^2, average flow rate of 3.52 m^3/s, and theoretical reserve of 1243 kw.

5. Soil and vegetation

The soil types in this project area and nearby area mainly are yellow soil and yellow brown soil, as well as a small amount of paddy soil in some parts. Horizontal zonality has yellow soil, while vertical zonality has yellow brown soil. Yellow soil and yellow brown soil come into being under warm and humid subtropical monsoon climate. They have strong allitization, obvious development level, and a value of about PH 6.5.

Vegetation conditions: The vegetation in the project area includes subtropical evergreen broadleaved forest and mixed deciduous forest zones. There is not any original vegetation any more. Secondary brushwoods and sod grow very well here, mainly including secondary forest vegetation such as pinus massoniana forest, cypress thickets, Chinese fir forest, and scrub-grassland rass as well as farmland vegetation such as rice, corn, canola, and vegetables at present. Sinan County has a forestry land area of 92006.67 hm^2, including forestland 72200 hm^2, shrubbery 6353.33 hm^2, open forest land 1446.67 hm^2, immature planting area 8626.67 hm^2, non-forest land 113.33 m^2, and suitable land for forest 3266.67 m^2. The forest coverage rate is 35.22%.

The forest vegetation in Sinan County has rich varieties, forming the good forest ecological environment. It has woody plants of more than 58 families, 92 genera, 196 species, including over 120 arbor species and more than 70 species of medicinal plants. Main arbor species include: pinus massoniana, cedarwood, weeping cypress, paulownia, robinia pseudoacacia, sweetgum, cedrela sinensis, oaks, platycarya strobilacea, Chinese tallow tree, lacquer tree, palm, Cherokee rose fruit and so on. Main shrub species include: firethorn, oak, bamboo, tea, silkworm, camellia, and so on. Main herbs include: 18 families and 65 genera such as themeda triandra, calamagrostis assimile, heteropogon contortus, miscanthus floridulus, Jinmao, salix leaves, and so on. Rare plants mainly include: taxus chinensis, beech, gingko, nanmu, and so on. Foreign introduced plants include: lodgepole pine, Italian poplar, poplar-zhonglinmeihe, triploid populus tomentosa, robinia pseudoacacia and so on.

6. Animals

There are more than 300 species of animals in Sinan County, including more than 20 species of livestock and poultry, 50 species of fish and more than

200 species of other wild animals and birds. Due to long-term human activities, forest resources have been reduced and wild animals have become rare. Current animal resources mainly are livestock and poultry. Main wild animals include rabbits, squirrels, goats, snakes, grass carp, crucian carp, loach, eel, etc.; Livestock and poultry include: pigs, cattle, sheep, horses, chickens, ducks, geese, rabbits, bees, etc.; Farmed fish species include: grass carp, carp, silver carp, etc. According to data collection and investigation, there have been no national protected rare and endangered wild animals found in the proposed project evaluation area.

3.2 Social Environment

3.2.1 Social economy

According to 2013 Statistical Yearbook or statistical data of 2013 Cadre Management Handbook of Tongren City and the project counties, 2012 socioeconomic status of the project area is shown in Table 3.2-1.

Table 3.2-1 Basic situations of counties in Guizhou rural development project financed by the World Bank Loan

Content		Unit	Tongren County	Dejiang County	Sinan County
I. Basic population status					
Number of villages and towns		Unit	169	20	27
Number of administrative villages		Unit	2825	345	489
# Major villages of anti-poverty project		Unit	1200	207	335
Total population		1×10^4 People	429.21	52.56	67.71
Rural population	Population	1×10^4 People	375.34	53.00	40.27
	Proportion	%	87.45	78.27	76.62
Minority population		1×10^4 People	274.32	41.02	32.84
Poverty population		1×10^4 People	145.21	14.18	19.09
Population density		People/km^2	238	254	304
II. Overall economic situation					
GDP		RMB 1×10^4	5352200	494303	610363
# Total output value of primary industry		RMB 1×10^4	1361300	173905	194741
Agriculture		RMB 1×10^4	1196600	104231	117000
Forestry		RMB 1×10^4	55000	2674	2592

Animal husbandry	RMB 1×10^4	831500	60574	63615
Others	RMB 1×10^4	722800	6428	10434
Total output value of secondary industry	RMB 1×10^4	150000	97360	144259
Total output value of tertiary industry	RMB 1×10^4	2440900	223038	271363
Proportions of the three industries		25.4：29.0：45.6	35:20:45	32:24:44
Per capita net income of farmers	RMB	5397	4137	4335
III. Land and resources				
Total area of land	Ha.	1800270	207192	223050
# Cultivated land	Ha.	179230	65673	76000
Per capita cultivated land	Mu	0.87	0.53	0.59
Forest land	Ha.	821119	67622	92007
Grassland	Ha.	190652	53200	15153
Water area	Ha.	22155	1104	2967
Barren land	Ha.	120067	27122	20892
VI. Agriculture and stockbreeding production				
Total seeded area of crops *	Ha.	560178	81866	96475
Total seeded area of grain *	Ha.	363543	51181	58334
Total grain output *	t	1173000	139486	228687
Seeded area of economic crops *	Ha.	188036	30683	38141

3.2.2 Present Condition of the Transportation in Tongren

1、Tongren City

(1) Roads: By the end of 2013, mileage in road open to traffic in Tongren is 22367.7km，with a road density of 123km/100km2, village roads of 17320.2km, accounting for 79%；national and provincial roads of 122.8km, accounting for 5.5% of the total value。As rated by technology level: substandard highway are of 16319.5 km, accounting for 74% of the total; roads of Level 4 are of 4247.7km, accounting for 19.1% of the total; roads of Level 3 and above are of 1800.5 km (including expressway 359 km, Level 1 road 3.6 km, Level 2 road 188.3 km, and Level 3 road 1250.6 km) accounting for 8% of the total.

(2) Railway: Hunan-Guizhou railway: it only gets through Yuping County in Tongren City, by Dalong economic development zone, with a length of 25km in Tongren.

Chongqing-Huaihua railway: the length of it within the territory of Tongren City is 95.471km, via 10 villages and towns in Songtao Miao autonomous county, Jiangkou county and Bijiang district, with 10 stations across the line. Among them, one is regional station (Tongren Station), two are county-level stations and one is freight station (Tongren station). The designed annual capacity for recent freight is 9.01 million tons, 14 pairs of passenger cars; and 10 million tons and 17 pairs of passenger cars for forward freight.

(3) Waterway: The total shipping mileage of Tongren is 460km. Among them, the fairway of class IV (Wujiang River) is 246 km; the fairway of class VII is 79 km (31km of Jinjiang River, Tongren and 48km of Songjiang River); fairways under class VII is about 135km (Shiqian river, Shiqian Yangxi District, Yuping Wuyang River, Ximen to Xiaojiangkou and Liangjiangkou to Guanyin Mountain).There are 3346 of all kinds of ships in the whole city with a gross tonnage of 18191 tons, of which: there are 321 operating passenger ships, 116 operating cargo ships, 292 ferry ships, 1769 agricultural use ships and 848 fishing ships.

(4) Aviation: Tongren Daxing Airport is located in Daxing Town of Songtao Miao Autonomous County at the junction of Xiang and Qian Province. On December 23, 2011, the important airport for regional tourism in Guizhou, Tongren Fenghuang Airport, held the opening ceremony and opening ceremony held in Tongren Fenghuang Airport, and the total investment of reconstruction is 427 million yuan. Since the first aviation on 7 July, 2001, Tongren Fenghuang Airport has opened five lines, which are Tongren-Guiyang, Tongren-Changsha, Tongren-Chongqing, Tongren-Guangzhou and Tongren-Shenzhen, for the needs for annual delayed passenger throughput of 320000 passengers. After airport navigation, it set up the air bridge from Tongren to places all over the country, which promotes the development and opening to the outside world of tourism resources in Tongren, speeds up the development of the western region and plays an important role in the promotion of the economic development in the whole Wuling mountain area.

2. Dejiang County

By the end of 2012, the mileage of highway and fairway open to traffic in Dejiang County is 3396 km, including: 3349 km township road and 47 km inland

waterway. As rated by administrative level: the highway is 72 km long, provincial road 126 km, county road 127 km, township road 257 km, village road 2080 km and group road 687 km with a density of highway of 161 km/km². The inland Class V fairway is 47 km long with one port of 800,000 tons level, three wharfs, and 28 ferries; there are 2 vehicle maintenance enterprises of Class I, 16 of Class II and 80 of Class III in the whole county. There is one secondary passenger station, one tertiary station and nine class VI stations.

3. Sinan County

By the end of 2012, the mileage of highway and fairway open to traffic in Sinan County is 4211.73km, including 4074.73 km village road mileage and 137 km inland waterway. As rated by administrative level: the total length of 2 provincial roads is 135.98 km, 8 county roads 245.92 km, 24 township roads 232.66 km, village roads 3434.8 km and 2 roads for special use 25.37 km. As rated by technical standard: the total length of roads of Class III is 85.8 km long, roads of Class IV 1026.8 km and substandard roads of 2962.13 km. As rated by surface: the total length of bituminous concrete roads 317.3 km, concrete pavement 420.3 km and clay bound macadam pavement 3337.13 km, with a density of highway of 187.2 km/km²

The water and land traffic of Sinan is very convenient with Songfeng Road getting through from east to west connecting with Sichuan, Guizhou and Hunan-Guizhou railway and the interior traffic takes Wujiang River as frame for 137km of navigable waters. Among which: 78km of Wujiang River in Sinan with a width of 200-340m; 8 passenger and freight wharfs with hundreds of ships and it is unobstructed for cargo ship under 200 tons flowing to Yangtze River at Peiling along the river.

3.3 Project Environment

Environment monitoring has not been done for this evaluation. The existing conventional monitoring data will be made full use of. According to the environmental monitoring data of project counties (Dejiang and Sinan) which is provided by *2012 Guizhou Environment Quality Report*, the ambient air qualities in Tongren City, Dejiang County, and Sinan County are good, meeting the secondary standard of GB3095-1996 *Ambient Air Quality Standard*. As the project area is

located in the rural areas, there are large industrial and mining enterprises found there, and no large-scale atmospheric pollution discharge points found, however. Therefore, the ambient air qualities are good, and they can meet the secondary standard of GB3095-1996 *Ambient Air Quality Standard*; The main rivers in the counties Dejiang County and Sinan County, where the project areas are located, are Wujiang main stream of Wujiang river water system in Yangtze river basin (fracture surfaces of Yanhe and Wuyangshu) and Yinjiang River (fracture surface of Xiyansi). According to the water quality monitoring values of these 3 provincial control monitoring sections, Yinjiang River can meet the Ⅱ standards of GB3838-2002 *Environmental Quality Standards for Surface Water*, better than the Ⅲ standards of its water environment function execution; However, the water quality of Yanhe fracture surface of Yanhe County in Wujiang and Wuyangshu in Sinan Couty is worse than Ⅴ-Class, with the total phosphorus content out of limits, which is mainly caused by the upstream city life wastewater as well as sewage disposals of some industrial and mining enterprises, failing to meet the Ⅱ standard of its water environment function execution. According to the routine monitoring data of Dejiang County and Sinan County in 2013, the water environment qualities of other rivers are good, which basically can achieve the function requirements of their functional zones. Sound environment: As the project area is located in the rural areas with light traffic, there are not any major noise sources. Therefore, the quality of acoustic environment is good, and it can meet the II-class regional standards of GB3096-2008 *Environmental Quality Standard for Noise*, with Leq60dB (A) during daytime and Leq50dB (A) at night.

3.4 Environmental Sensitive Area

3.4.1 The relationship between the proposed project and the sensitive areas such as nature reserves, scenic spots, culture relic protection sites, and drinking water protected areas in the project area

According to field survey, data collection as well as the verification and demonstration of local administrative departments of 2 project counties(see annex), except for that Shangguanqing to Langan road and Sanchatang are in Siyetun county-level nature reserve in Sinan County, and Qinglongju Bridge is in the

Longdijiang scenic region Wujiang Bailuzhou scenic area in Sinan County, there are no sensitive areas such as nature reserves, scenic spots, culture relic protection sites, and drinking water protected areas, and no national protected wild rare endangered plants and animals as well as ancient famous trees found within the land occupation of other constructions for Guizhou rural development project. The details are shown in Table 3.4-1.

Table 3.4-1 Summary table to show whether the sensitive areas are involved by project implementation area

No.	Project county	Sensitive area	Whether involved by project implementation area	Administrative department in charge of verification and certification
1	Dejiang County	A. Nature reserve B. National protected valuable rare endangered wild animals, plants and ancient trees	Not involved Not found	Dejiang Forestry Bureau
		Scenic spots, forest park, geological park	Not involved	Dejiang Housing & Urban and Rural Construction Bureau
		Culture relic protection site	Not involved	Dejiang Cultural Relics Bureau
		Drinking water conservation district	Not involved	Dejiang Environmental Protection Bureau
		Basic farmland preservation area and covered mineral resources	Not involved	Dejiang Land and Resources Bureau
2	Sinan County	A. Nature reserve B. National protected valuable rare endangered wild animals, plants and ancient trees	Not involved Not found	Sinan Forestry Bureau (Only the road between Shangguanqing and Langan and Sanchatang Bridge are located in Siyetun Nature Reserve of Sinan County.)
		Scenic spots, forest park, geological park	Not involved	Sinan Housing & Urban and Rural Construction Bureau (Only Qinglongju Bridge is located in Bailuzhou scenic spot in Wujiang of Sinan County.)
		Culture relic protection site	Not involved	Sinan Administration of Culture, Sport, Broadcasting, Television and Tourism
		Drinking water conservation area	Not involved	Sinan Environmental Protection Bureau
		Basic farmland preservation area and covered mineral resources	Not involved	Sinan Land and Resources Bureau

3.4.2 Scenic spot

2. Sinan County——Sinan Wujiang Bailuzhou Scenic Area

(1) Coverage

Wujiang Bailuzhou Scenic Area reaches to Maogaiding of Longdijiang Scenic Spot in the east, Qingniantai of Centougai Scenic Spot in the west, Ranwutang River of Centougai Scenic Spot in the north and Houtun of Haojiawan Scenic Spot in the south, mainly involving eight township administrative divisions suh as Tngtou Town, Banqiao Tujia-Miao Autonomous Prefecture, Sandaoshui Tujia-Miao Autonomous Prefecture, Wengxi Town, Wenjiadian Town, Hepengxi Town, Changba Tujia-Miao Autonomous Prefecture and Yangjia'ao Tujia-Miao Autonomous Prefecture. According to the field survey, Qinglongzui Bridge of the proposed project is located in Sinan Wujiang Bailuzhou Scenic Area Longdijiang Scenic Spot. It has geographical coordinates with east longitude of 107°54′02″——108°16′36″ and north latitude of 27°39′39″——27°54′44″, covering an area of 86 km^2, see attached Fig. 3.4-1 for detail.

(2)Partition of the scenes

Sinan Wujiang Bailuzhou Scenic Area is divided into one independent scenic group, five scenic regions and 56 scenic spots. The five scenic regions are county independent scenic group, Haojiawan scenic area, Longdijiang scenic area, Changba Stone Forest scenic spot, Jingzhuyuan scenic spot, and Centougai scenic spot.

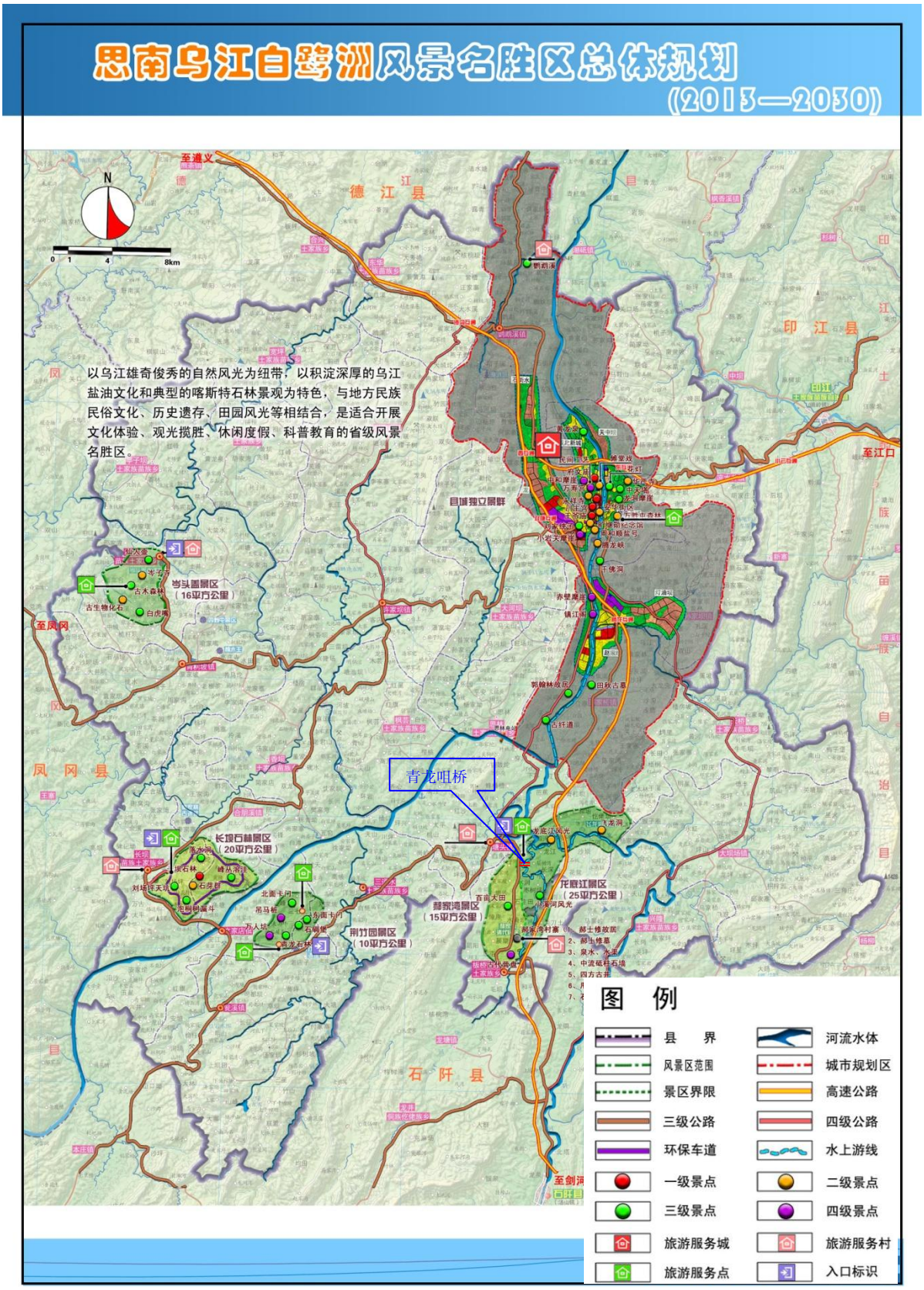


Fig. 3.4-1 Distribution Diagram of the main scenic areas and spots within Wujiang scenic resort in Bailuzhou of Sinan County

(2) Landscape resources

The landscape resources of Sinan Wujiang Bailuzhou Scenic Area are mainly distributed in five areas, namely county independent scenic group, Haojiawan zone, Changbe Stone Forest area, Jingzhuyuan area, and Longdijiang area. They mainly present four characteristics, namely "city, river, village, forest". The 56 landscape resources include 6 kinds including landscape, waterscape, Ecological landscape, architecture, famous historical site, and scenery sights as well as 19 forms such as stone forest & rockscape, karst cave, lofty peak & mountain view, geological treasure, canyon & precipice, waterfall & spring, rivers & lake, artesian well & mountain stream, pastoral scenery, forest plant, religious buildings, residential ancestral hall, landscape architecture, memorial building, engineering structures, site remains, cliff & precipice, folk art, and folk custom. Among them, there are 21 natural landscape resources, accounting for 37%, 35 cultural landscape source, accounting for 63%. The comprehensive scenic spots and landscape evaluation of Sinan Wujiang Bailuzhou Scenic Area is shown in Table 3.4-2.

Table 3.4-2 Summary table for comprehensive scenic spots and landscape evaluation of Sinan Wujiang Bailuzhou Scenic Area

No.	Scenic resource distribution	Scenic spot name	Type traits	Comprehensive score	Level
1	Independent scenic group in the county	Fuwen Temple	Religious building	83	1
2		Wangye Temple	Religious building	83	1
3		Chuanzhu Palace	Civilian ancestral temple	83	1
4		Yongxiang Temple	Religious building	83	1
5		Zhouheshun Salt	Civilian ancestral temple	76	2
6		Huayan Temple	Religious building	74	2
7		Tenglong Gorge	Canyon & Precipice	73	2
8		Kuangjixun memorial hall	Memorial building	73	2
9		Wanshou Palace	Civilian Ancestral Temple	73	2
10		Wanshengtun Forest	Forest vegetation	72	2

11		Nuotang opera	Folk literature and art	71	2
12		Liujia Tongzi	Civilian ancestral temple	70	3
13		Anhua Blocks	Civilian ancestral temple	70	3
14		Zhongtian Tower	Landscape Architecture	69	3
15		Huanglong Spring	Waterfall & spring	65	3
16		Longdongmo Cliff	Cliff & precipice	63	3
17		Lanterns	Folk literature & art	67	3
18		Tianqiu Ancient Tomb	Historical site & remains	66	3
19		Thousand-Buddha Grottoes	Karst Cave	68	3
20		Guo Hanlin's Former Residence	Civilian ancestral temple	67	3
21		Ancient Towpath	Historical site & remains	63	3
22		Yingwu Creek	Artesian well & mountain stream	69	3
23		Chibimo Cliff	Cliff & precipice	63	4
24		Little Yanguanmo Cliff	Cliff & precipice	63	43
25		Zhonghemo Cliff	Cliff & precipice	63	4
26		Folk Craft	Folk literature & art	64	4
27		Zhenjiang Pavilion	Historical site & remains	62	4
28	Haojiawan area	Hao Shixiu's Former Residence	Civilian ancestral temple	78	2
29		Hao's Tomb	Historical site & remains	76	3
30		Spring, Water Channel	Artesian well & mountain stream	67	3
31		Hundred Acres of Field	Pastoral scenery	65	3
32		Mainstay Stone Wall	Engineering structures	65	3
33		Foursquare Ancient Well	Artesian well & mountain stream	64	3
34		Shuaishen Day	people & customs	63	3
35		Slate Avenue and Rock Gangway	Engineering structures	55	4
36		Ancient Camp	Historical site & remains	51	43

37	Longdijiang area	Feilong Cave	Karst Cave	75	2
38		Longdijiang Scene	Rivers & streams	74	2
39		Xiaoxihe Scene	Rivers & streams	68	3
40	Changba stone forest area	Changba Stone Forest	Stone forest & rockscape	85	1
41		Clint Group	Stone forest & rockscape	75	2
42		Luoshui Hole	Karst Cave	66	3
43		Peak Groups & Karst Depression	Lofty peak & mountain view	66	3
44		Liuchangping Sky Hole	Karst Cave	65	3
45		Kiri Funnel	Karst Cave	63	3
46	Jingzhuyuan area	East Tollbar	Historical site & remains	65	3
47		North Tollbar	Historical site & remains	65	3
48		Stone Fort	Historical site & remains	63	3
49		Longqing Stone Forest	Stone forest & rockscape	64	3
50		Mass Grave	Historical site & remains	55	4
51		Diaomazhuang	Historical site & remains	54	4
52	Centougai area	Cenzi Temple	Historical site & remains	73	2
53		Palaeobios Fossil	Geological treasure	72	2
54		Baihuzui	Historical site & remains	64	3
55		Xianrenhu	Lofty peak & mountain view	68	3
56		Ancient forests	Forest plants	62	3

According to field investigation, Qinglongju Bridge of the proposed project is located in the Longdijiang scenic region of Bailuzhou, Wujiang in Sinan. The positional relationship is shown in attached Fig. 3.4-1.

3.4.2 Nature reserve

There is only one nature reserve in Dejiang County and Sinan County —— Sinan Siyetun nature reserve, which belongs to county level nature reserve. Located in Yangjia'ao Town and Qinggangpo Town, it covers a total area of 2859 hm2, with a forest coverage rate of 29.8%, east longitude 107°53′48″-108°03′47″, north latitude 27°36′19″- 27°43′40″, and 40 km away from the county. It reaches Wanfodong in the east, Sifangjing Yantou River in the west, opposite to Xujiaba,

Qinggangpo to Dapenshui road in the south, and Yangjia'ao Town in the North, with a length of 8 km long from east to west, and 4 km wide from north and south. The main objects of protection are forests and wildlife, and the protection type is forest ecology, which is approved by Sinan Forestry Bureau in 1999. Its scope is shown in the attached Fig. 3.4-2.

There are hundred species of national Grade II wild animals in the reserve such as reeves's pheasant, golden pheasant, lady Amherst pheasant, silver pheasant, forest musk deer, pangolins, civet cat, rasse, otter, spot antelope, blue sheep, grass owl, eagle owl, and egrets. In the underground river of Wanfodong in the reserve, a white transparent fish has also been found, which is called as transparent fish by the local people.

There is a nanmu of more than 1300 years old in Tujia settlement of Gaozhuangsi Village in Qinggangpo Town within the reserve, with a height of 25 m, diameter at breast height (DBH) of 2.8 m, and crown coverage area of 1.5 acres, known as the "King of Guizhou Nanmu". There also are 12 nanmus with DBH of 1-2 m in its surroundings. The shortest distance between Shangguanqing to Langan road to be constructed and these trees is about 4.5 km. Besides, national protected Grade II trees such as beech and gingko distribute sporadically in this region. Thereof, beech is the top tree in the county, with a height of 22 m and DBH of 2 m.

According to field investigation, both Shangguanqing to Langan road and Sanchatang of the proposed project are located in Sinan Siyetun nature reserve. The positional relationship is shown in attached Fig. 3.4-2.

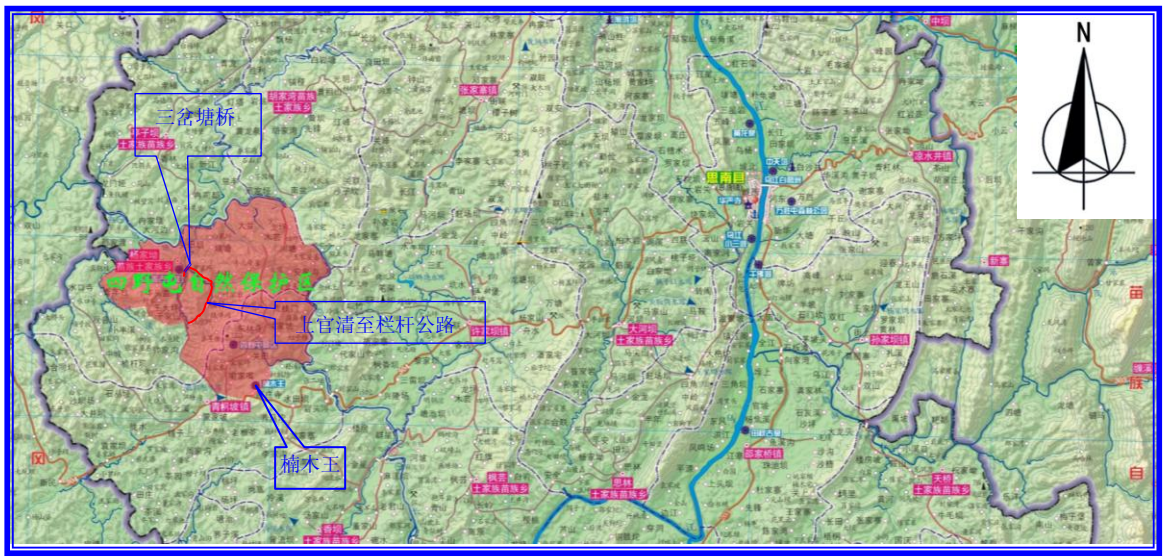
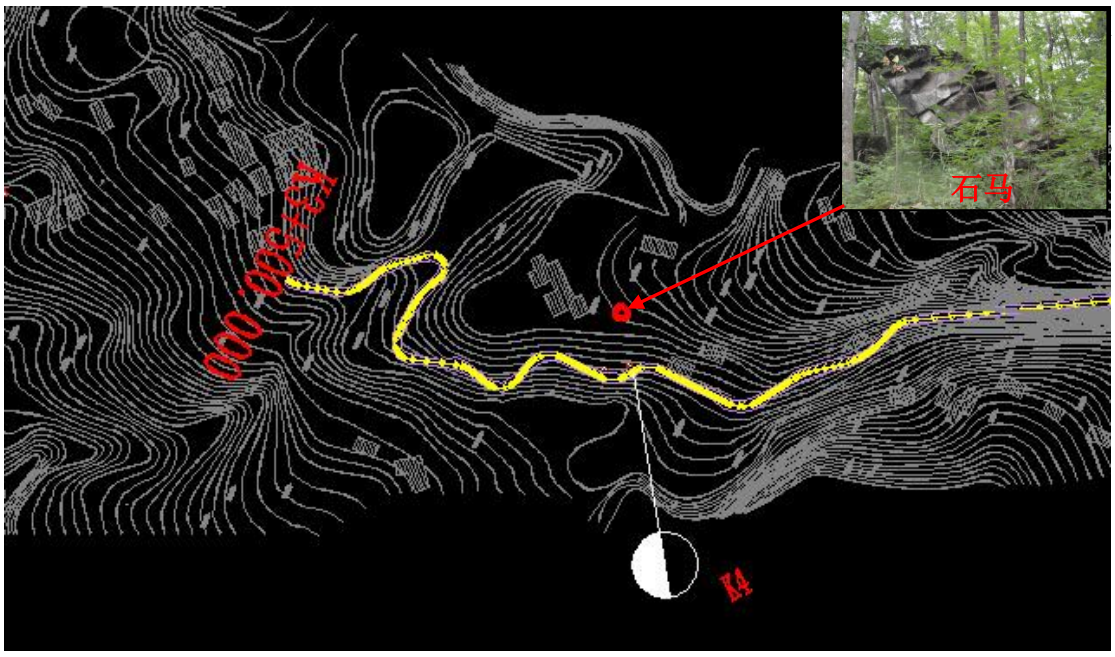


Fig. 3.4-2 Location map of Siyetun county-level nature reserve of Sinan

3.4.3 Material culture resources

According to the collected information and investigation of the current situation, a natural landscape stone horse is found at about 20 m left to K4+000 on Hetou to Dayuan road in Quankou Town of Dejiang Couty. It belongs to natural monument. According to Jiajing Sinan Gazetteer from Ming Dynasty, it was among the top ten scenic spots of Sinan County and top four scenic spots of Yongzhou., as shown in Fig. 3.4-3.



to Dayuan Road in Dejiang County

3.4.4 Drinking water reserves

1. Dejiang county: Its drinking water reserves mainly are Dalongqian, Chaoshuihe, Zhujiagou centralized drinking water sources reserve, etc.

2. Sinan County

Its drinking water reserves mainly are Silin hydropower station, Hexi waterworks centralized drinking water sources reserve, etc.

According to the field investigation and demonstration of Dejiang Environmental Protection Bureau and Sinan Environmental Protection Bureau, the proposed rural roads and bridges to be constructed are not in any drinking water source reserve of the two counties.

3.5 Main Protection Targets

The environmental protection targets along the project line are shown in Table 3.5-1 and Table 3.5-2. Fig. 3.5-1 shows part of the scene photos of the protection targets.

Ancient nanmu of Nangan Village

Lengshuiyan Bridge of Changfeng Village

Chuanqian Bridge of Changfeng Village

Zhongba Elementary School of Gonghe Town

Shenxi Bridge of Nangan Village

Pianyan Bridge of Jiancha Town

Sibao Elementary School of Wenping Town

Stone Horse in Mala Village of Quankou Town

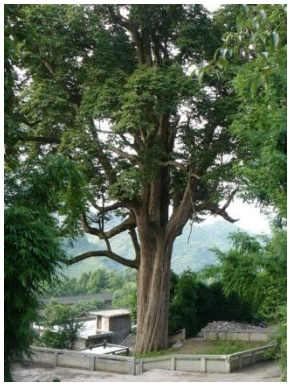
Huangba Elementary School of Shaxi Village

Tiekeng Elementary School of Wenping Town

Guanyinyan Bridge of Jiancha Town

Zhongba Elementary School of Gonghe Town

Fig. 3.5-1 Site photos of the protection targets in Dejiang County of the proposed project



Ancient Nanmu of Siyetun (Gaozhuang Temple)

Ancient nanmus, Cypresses (Shangguanqing)

Ancient Cypresses (Aoshang)

Ancient masson pines (Daping)

Sanchatang Bridge of Yangjia'ao Village

Ancient Xylosmas (Lijiazhai)

Ancient Lindera Touyunenses (Pengjia)

Zhushan Elementary School of Wengxi Town

Tangjiaba Bridge of Wengxi Town

Qinglongju Bridge of Tangtou Town | **Kongjiahe Bridge of Wengxi Town** | **Xinmin Elementary School of Sandaoshui Village**

Fig. 3.5-2 Site photos of the protection targets in Sinan County of the proposed project

Table 3.5-1 Main environmental protection targets of the proposed project

Environmental element	Protection target	Road Segment	Environmental characteristic	Influence factor
Ecological environment	Forest land	Whole road	Hills, mountainous area	Land occupation for road, roadbed filling, excavation
	Soil and water conservation	Whole road	Hills, mountainous area	Fill, excavation
	Soil field	Whole road	Hills, mountainous area	Spoil
	Siyetun county-level nature reserve of Sinan County	Shangguanqing to Langan Road and Sanchatang Bridge	Vegetation of county-level nature reserve, rare animals and plants, famous ancient trees, wild animal passageways, etc.	Damage caused by road construction, ecological impact, disturbances to the animals
	Bailuzhou scenic area in Wujiang of Sinan County -- Longdijiang scenic area	Qinglongju Bridge	Stream sightseeing, forest ecology	Damage caused by construction, impacts on landscape
Sound environment, ambient air, and social environment	Residents along the road	See Table 3.4-2 Statistical table for sensitive spots to the environment	Air, sound sensitive spots within 200m of both sides of the road centerline	Construction noise and dust, traffic noise, automobile exhaust
Water environment	Mati River and its tributaries	Upstream section of Wujiang entrance of Mati River	Rivers, streams, Ⅱ-class, Ⅲ -class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Yuxi River	Upstream section of the confluence of Mati River	Rivers, Ⅲ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Changfeng River	Upstream section of the confluence of Mati River	Rivers, Ⅲ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase

	Liuchi River and its tributaries	Dejiang, Sinan segments of the upstream section of Wujiang entrance	Rivers, streams, Ⅱ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Fengle River and its tributaries	Section within Dejiang, upstream section in WuChuan County, Nangan River	Streams, Ⅲ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Yinjiang River	Dejiang section of Yinjiang River	Rivers, Ⅱ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Wujiang River	Sinan to Wujiang Reservoir section and its tributaries	Rivers, Ⅲ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Wujiang River	Upstream Dejiang, Sinan section and tributaries	Rivers, Ⅱ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Longdijiang	Sinan section of downstream of Shiqian River	Rivers, Ⅱ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
	Qingdu River	Upstream of Wujiang confl uence	Rivers, Ⅱ-class water	Construction waste water, rainwater and accidental contaminants on the pavement during the operational phase
Material and cultural resources	Stone Horse	About 20m left to K4+000 of Hetou to Dayuan Road in Quankou Village of Dejiang County	Natural heritage	Roadbed excavation
	Tomb	123 tombs, including 82 in Dejiang County, 41 in Sinan County	Private tomb, no significant cultu ral, archaeological and palaeontological value	Land occupation for road, roadbed filling, excavation

Table 1-4 Sensitive Spots List to the Acoustic Environment, Ambient Air and Social Environment along the Lne for the Proposed Project

Serial No.	Name of sensitive spot	Mediu m stake mark	Shortest distance to center line（m）	Disper sion （m）	Position	House holds in the first row	Conditions of sensitive spot

Dejiang County							
1. **Highway from Mingxi to Donquan**							
（1）	Fuxing	K0+100	5	0	Both sides, left and right	120 households	150 households, 610 persons
（2）	Leichong dam	K1+200	10	+1	Both sides, left and right	35 households	50 households, 210persons
（3）	Baopen village primary school	K1+700	60	+3	Left side direction		Preschool, grade 1-5, 8 teachers, 115 students
（4）	Yazitou	K2+400	10	+1	Both sides, left and right	15 households	35 households, 153 persons
（5）	Hekan	K2+750	15	+1	Both sides, left and right	11 households	32 households, 129 persons
（6）	Pengxikou	K3+300	12	+1	Both sides, left and right	22 households	43 households176 persons
(7)	Yelanxi	K4+900	12	0	Both sides, left and right	21 households	45 households, 189 persons
(8)	Hongyanzi	K5+600	10	0	Both sides, left and right	10 households	31 households, 128 persons
(9)	Sangongfen	K7+200	11	0	Both sides, left and right	18 households	36 households, 157 persons
(10)	Xiaobazi	K7+500	50	+2	Right	8 households	23 households, 92 persons
(11)	Nijiagou	K8+100	20	+1	Both sides, left and right	9 households	31 households, 129 persons
(12)	Dongquan Primary School	K10+450	50	+1	Right		26 teachers , 342 students, preschool, grade 1-6
(13)	Dongquan	K10+500	10	0	Both sides, left and right	45 households	102 households, 418 persons
2. **Jiancha to Shaxi**							
(1)	Luojiaao	KO+900	50	0	Right	5	36 households, 187 persons
(2)	Majiawan	K5+000	10	0	Right	10	45 households, 230 persons
(3)	Jiaoxi	K7+200	10	0	Right	12	50 households, 255 persons
(4)	Naoshuiyan Primary School	K7+200	10	0	Right		25 teachers , 220 students, preschool to grade 6
(5)	Dazhuyuan	K10+500	100	+5	Right	5	15 households, 80 persons
(6)	Daijiashan	K11+600	100	-2	Right	6	45 households, 228 persons
(7)	Niaobaotuo	K16+200	100	+2	Left	9	25 households, 130 persons

(8)	Shilinggang	K18+300	10	0	Left	4	35 households, 180 persons
(9)	Lijiazhai	K22+100	10	0	Left	4	46 households, 235 persons
3. **Hepeng to Longxi**							
（1）	Old house	KO+000	8	0	Left	5	35 households, 180 persons
（2）	Old hepeng	K1+706	8	0	Left	20	90 households, 480 persons
（3）	Hepeng Primary School	K1+706	8	0	Right	20	4 eachers, 125 students, grade 1-4
（4）	Zhoujiazhai	K2+450	8	0	Left	12	35 households, 175 persons
（5）	Hexin	K2+800	8	0	Left	9	30 households, 162 persons
（6）	Tuodixia	K8+100	15	0	Left	12	35 households, 189 persons
（7）	Guan Village	K9+800	8	0	Left	24	80 households, 380 persons
（8）	Lizi dam	K12+500	8	0	Right	9	30 households, 157 persons
（9）	Yantangyin reservoir	K13+100	15	-5	Left		Agricultural irrigation reservoir
（10）	Liujiawan	K13+500	25	+2	Left, right	8	42 households, 175 persons
4. **Qinjiawan to Chaodi**							
(1)	Qinjiawan	K0+000	10	0	Left, right	15	20 households, 110 persons
(2)	Xiazhong dam	K2+000	10	0	Left	10	20, 98 persons
(3)	Zhongbawanxiao	K4+700	10	0	Right		teachers :15，students: 241，grade 1-6
(4)	Shaba	K4+700	10	0	Right	11	30, 162 persons
(5)	Qinggangbao	K5+800	10	0	Right	10	20, 109 persons
(6)	Xiataping	K10+000	10	0	Right	12	50 households, 261 persons
5. **Changba to Wangpai**							
（1）	Tongxin Kindergarden	K0+100	100	0	Left	Fence	about 200 persons
（2）	Longmendizu	K2+850	8	0	Left, right	15 households	about 40 households, 160 persons
（3）	Dawn Primary School	K4+700	20	0	Left		12 teachers, 400 students
（4）	Bajiaotuo	K6+450	8	0	Left, right	10 households	about 20 households, 100 persons
（5）	Wangpai Village	K8+900	10	0	Left, right	10 households	about 25 households, 100 persons
6. **Pingyuan to Nangan**							
（1）	Renjiashan	K8+200	15	1	Right	6 households	33 households, 136 persons
（2）	Jinzhuyuan	K8+500	10	0	Left	10 household	58 households, 272 persons

						olds	
（3）	Lion rock	K10+000	30	2	Left	5 households	38 households, 216 persons
（4）	Yangliuchi	K11+100	10	1	Left, right	10 households	81 households, 346 persons
（5）	Jinpen Primary School	K11+200	90	2	Left		9 teachers, 236 students , grade 1-5
（6）	Wujiawan	K12+500	20	1	Right	8 households	78 households, 386 persons
（7）	Qiaowan	K12+700	50	2	Left	5 households	38 households, 198 persons
（8）	Caojiazhai	K13+500	20	2	right	6 households	92 households, 375 persons
（9）	Longjiawuji	K14+900	10	0	left,right	20 households	62 households, 256 persons
（10）	Zeng ancestral hall	K15+180	100	-3	left		Three-level independent scenic spot
（11）	Tianjin Primary School	K15+460	50	-1	left		12 teachers, 360 students, kindergarden, grade 1-6
（12）	Building	K15+500	8	0	left,right	15 households	52 households，217 persons
（13）	Gunanmu	K15+600	200	-2	left		Nanmuwang, Three-level independent scenic spot, tree heigh is about 35m, periphery is about 11.5m, tree-age is above thousands years
（14）	Yejiaba	K16+580	10	0	left,right	18 households	96 households, 385 persons
（15）	Hejiazhai	K17+600	10	0	left,right	35 households	205 households, 429 persons
（16）	Fire-stone Primary School	K18+200	50	1	right		6 teachers, 84 students, grade 1-3
（17）	Fire-stone slope	K18+220	10	0	left,right	20 households	50 households, 208 persons
（18）	Dalongtang	K19+300	20	1	left	10 households	62 households, 253 persons
（19）	Maojijing	K20+150	10	0	left,right	10 households	38 households, 151 persons
（20）	Baiyanjiao	K20+38	25	1	left	8	30 households, 123 persons

		0				household	
（21）	Nangan Village	K21+320	8	0	left,right	42 household	158 households, 638 persons
7. **Datu to Yellow Dam**							
(1)	Datu	K0+000	10	0	right	5	25 households, 134 persons
(2)	Yellow Dam	K3+100	100	0	right	5	34 households, 180 persons
8. **Jiancha to Great River**							
（1）	Jiancha Town	K0+000	10	0	left,right	26 household	45 households, 184 persons
（2）	Aspen tuo	K1+450	20	2	right	5 household	25 households, 115 persons
（3）	Goujia hill	K2+250	15	2	left,right	5 household	74 households, 317 persons
（4）	Yangjiazhai	K4+000	20	-4	left,right	10 household	45 households, 189 persons
（5）	Great river	K4+653	50	1	right in front	6 household	25 households, 114 persons
9. **Changfeng to Duoping**							
（1）	Anjiazhai	K0+900	12	0	left,right	15	about 35 households, 153 persons
（2）	Changfeng reservoir	K2+700	15	-10	right		Drink for persons, irrigation
（3）	Tongyou dam	K4+800	12		left,right	10	about 20 households, 60 persons
（4）	Nongchen	K6+400	10		left	8	about 20 households, 80 persons
（5）	Zhongzhuang furrow	K8+600	10		right	12	about 20 households, 120 persons
（6）	West zhao	K11+050	8		left,right	5	about 20 households, 60 persons
（7）	Duoping	K12+250	8		left,right	20	about 30 households, 120 persons
（8）	Duoping school	K12+300	12	0	right		28 teachers 28, 650 students
10. **Fengjiazhai to Zhayu**							
（1）	Tianchizu	K0+900	8	0	left,right	10 household	about 18 households, 80 persons
（2）	Tuodi Village	K2+050	8	0	left,right	5 household	about 30 households, 200 persons
（3）	Sibao Primary School	K3+200	20	0	left		11 teachers, 210 students
（4）	Camphor tree	K0+800	15	0	left		Already hang the tag (3)
11. **Bridgehead to Salt well**							
(1)	Jipayin	K6+000	10	0	left	5	60 households, 298 persons
(2)	Yanjing	K6+900	10	0	left	6	20 households, 89 persons

	ditch						
12. **Mottled bamboo garden to Hepeng**							
（1）	Mottled bamboo garden	K0+000	15	0	right	5	35 households, 181 persons
（2）	Jingtou Dam	K1+600	15	0	right	6	40 households, 198 persons
（3）	Shangzhai	K3+500	50	0	right	9	54 households, 268 persons
（4）	Paifang	K3+500	25	0	left	6	15 households, 80 persons
（5）	Renlai Dam	K4+100	200	0	right	7	50 households, 254 persons
（6）	Dangjia Dam	K4+900	100	0	right	20	80 households, 396 persons
（7）	Yantangwan	K6+000	80	0	left	5	15 households, 78 persons
（8）	New hepeng	K8+500	8	0	right	25	95 households, 475 persons
13. **Ginkgo tuo to Dragon birdge**							
(1)	Ginkgo tuo	K0+000	10	0	left	10	30 households, 161 persons
(2)	Wuji Dam	K0+700	10	0	right	12	20 households, 110 persons
(3)	Baiyangxi	K5+300	15	+1	right	9	39 households, 210 persons
(4)	Zhangjiawan	K8+000	15	0	right	12	25 households, 135 persons
(5)	Muzhuan	K9+600	50	0	left	8	40 households, 210 persons
(6)	Duangongping	K10+500	10	0	right	6	30 households, 162 persons
(7)	Lion head	K14+000	15	0	left	12	70 households, 356 persons
(8)	Zhushixi	K16+000	50	0	left	9	30 households, 156 persons
14. **Wenping to Silver**							
（1）	Tiekeng Village	K0+600 K1+200	8	0	left,right	10 households	about 18 households, 80 persons
（2）	Tiekeng Primary School	K1+500	30	0	right		15 teachers , 400 students
（3）	Haixigou	K4+500 K5+000	8	0	left,right	5 households	about 20 households, 100 persons
（4）	Qinggang Mountain	K6+400	10	0	left,right	10 households	about 20 households, 100 persons
15. **Zhangjiajie to Yanmen**							
(1)	Zhangxinjie	K0+000	10	0	right	7	70 households, 345 persons
(2)	Shangping	K3+000	10	0	left	15	80 households, 410 persons
(3)	Yanmen	K3+746	10	0	left	8	60 households, 312 persons
16. **Weigangzui to Gonghe**							
(1)	Old zhaitou	K1+600	8	0	left	11	41 households, 189 persons
(2)	Baping	K3+500	8	0	left	8	21 households, 90 persons
(3)	Baping Primary School	K3+500	10	0	left		7 teachers, 90 students, grade 1-6
17. **New field to Long line**							

（1）	Xinchang Primary School	K0+000	100	+1	right		485 students , 25 teachers, grade 1-6, preschool
（2）	Big wooden cellar	K2+100	10	0	right	6	19 households, 98 persons
（3）	Shagangtou	K3+000	20	0	right	8	20 households, 110 persons
（4）	Goujin Dam	K4+800	8	0	right	12	30 households, 156 persons
（5）	Long line Primary School	K4+800	8	0	left		T3 eachers , 59 students, grade 1-3
（6）	Jinjiachao Reservoir	K6+260	15	-10	left		Agricultural irrigation reservoir
（7）	Jinjiachao	K7+200	20	0	left	7	15 households, 56 persons
18. **Meizi in Fuxing Town to Huayuanzi Highway**							
（1）	Meizi	K0+000	10	0	two sides direction	12 households	65 households,265 persons
(2)	Wanli	K0+700	30	+3	Right side direction	15 households	35 households, 155 persons
(3)	Jia Village	K2+000	10	+1	both sides direction	36 households	62 households, 253 persons
(4)	Longtan Dam	K3+700	20	-4	Right side direction	10 households	23 households, 59 persons
(5)	Luotong Dam	K4+400	15	+2	Left side direction	20 households	45 households, 186 persons
（6）	Jiumingguan	K6+100	50	+3	right in front	5 households	15 households, 65 persons
19. **Hetou to Dayuan**							
（1）	Mala Village	K1+400	8	0	left,right	about 20 households	about 60 households, 240 persons
（2）	Stone horse	K4+000	20	+5	Left side		Belongs to natural culturel relic, locates in Quankou village
（5）	Dragon tongue	K7+300		About +25	Left side		Side slope landslide
（6）	Xianba Primary School	K7+800	3	0	Left side	Fence and door	teachers 15 persons, students 400 persons
（7）	Xianba Village	K7+650	5	0	right		about 20 households, 80 persons
（8）	Sandanxi River	K8+300	8	-4	Left side		Sandanxi River
（9）	Pig farm Village	K9+700	4	-5	Right side	3 households	Lower than road surface, side ditch has not been set
（10）	Pig farm Village	K11+200	8	0	left,right	15 household	about 30 households, 120 persons

						olds	
20. **Below dam to Yalao hill**							
(1)	Below dam	K0+000	15	1	left,right	10 households	60 households, 242 persons
(2)	Tucheng dam	K2+100	100	1	left	8 households	41 households, 167 persons
(3)	Yalao hill	K3+500	20	1	left,right	9 households	33 households, 146 persons
21. **Laozhai to Daba head**							
(1)	Hexing Middle School	K0+000	150	2	right		50 teachers, 806 students, middle school grade 1-3, 12 classes
(2)	Daba head	K2+530	15	0	left,right	10	61 households, 248 persons
22. Three-layer rock to An hill							
(1)	Yard	K3+300	10	0	right	5	51 households, 220 persons
23. **Changba to New beach**							
（1）	Gaoqing	K1+000	12	0	left,right	10 households	about 20 households, 80 persons
（2）	New beach	K5+500	10	0	right	12	about 30 households, 120 persons
24. **Shenxiyakou to Yellow earth**							
（1）	Lizikan	K0+950	8	0	left,right	10 households	about 25 households, 100 persons
（2）	Weijiazhai	K2+050	8	0	left,right	20 households	about 40 households, 160 persons
（3）	Shang yellow earth	K3+000	8	0	left,right	8 households	about 30 households, 120 persons
25. **Chazi hill to Phoenix**							
（1）	Qili Primary School	K0+100	100	0	left		5 teachers, 200 students
（2）	Yangchang Road	K2+900	8	0	left,right	15 households	about 40 households, 160 persons
（3）	Phoenix Primary School	K2+400	30	0	right		270 students , 8 teachers
26. **Dejiang to Luqing**							
(1)	Meizi Dam	K3+500	6	0	left,right	21	58 households, 200 persons
(2)	Yantang Primary School	K3+500	20	0	right		25 teachers, 260 students, grade 1-6（includes preschool）
(3)	Mottled bamboo garden	K4+600	15	-2	right	6	22 households, 123 persons
(4)	Zhaojia hill	K7+000	10	-2	left	5	51 households, 267 persons

(5)	Cement pool	K8+500	10	0	right	4	42 households, 189 persons
(6)	Zhangjia hill	K9+100	10	0	left	5	42 households, 155 persons
(7)	Wujikan	K10+100	10	0	left	8	57 households, 272 persons
(8)	Xilinxi	K13+800	10	0	left	6	25 households, 125 persons
(9)	Qingshuitang	K19+500	10	0	left	10	27 households, 115 persons
(10)	Qingshuitang Center Primary School	K19+500	15	0	left		11 teachers, 168 students, grade 1-6（includes preschool）
(11)	Luqing dam	K23+000	10	0	left	15	52 households, 213 persons
(12)	Luqing Primary School	K23+000	15	0	left		9 teachers, 150 students , grade 1-6（includes preschool）
(13)	Sandbank	K25+120	8	0	right	8	36 households, 170 persons
(140	High cross wall	K25+400	8	0	left	10	40 households, 205 persons
(15)	Temple dam	K26+100	100	0	left	5	30 households, 155 persons
27. **Gonghe bridgehead to Hualiangai**							
(1)	Hualiangai	K2+600	8	0	right	9	15 households, 77 persons
28. **Yuzhong field to Daping**							
(1)	Stabstone brook	K0+000	50	+4	right	4	18 households, 90 persons
(2)	Qili brook	K1+600	100	+1	left	12	64 households, 274 persons
(3)	Qili brook Primary School	K1+600	50	0	left		3 teachers, 36 students, grade 1-3and preschool
(4)	Dapingshang	K3+330	10	0	right	6	38 households, 176 persons
29. **Dingjia hill to Chawotuo**							
(1)	Dingjia hill	K0+000	6	0	left	4	7 households, 40 persons
(2)	Chawotuo Primary School	K1+600	20	0	left		4 teachers, 41 students , grade 1-3
(3)	Chawotuo	K1+600	10	0	right	9	55 households, 245 persons
30. **Feng brook to Dongwan**							
(1)	Walnut bay	K1+000	8	+1	left	10	In total 30 households, 161 persons
(2)	Dongwan village	K1+390	10	-2	right	8	In total 40 households, 208 persons
31. **Old brook to Guan Village**							
（1）	Guan Village	K2+000	10	0	left	24	80 households, 380 persons
32. **South bamboo ditch to Dengjia**							
(1)	Dengjia	K2+623	10	0	right	12	45 households, 245 persons
(2)	Dengjia	K2+300	15	0	right		2 teachers, 25 students ,

	Village Primary School						grade 1-3
33. **Xinzhai to Zaoni brook**							
(1)	Xinzhai		100	+5	left	5	56 households, 298 persons
(3)	Zaoni brook		10	0	left	8	40 households, 212 persons
34. **Big tree bay to Jiantai**							
(1)	Big tree bay	K0+000	15	+1	left,right	6 households	35 households, 152 persons
(2)	Middle zhai	K0+800	18	+2	right	5 households	55 households, 231 persons
(3)	Lizitai	K7+700	15	+2	right	10 households	36 households, 459 persons
35. **Flame fire to zaojiaodou**							
(1)	Flame fire	K2+100	25	+2	left,right	5 households	31 households, 127 persons
(2)	Zaojiaodou	K4+150	15	+1	left,right	7 households	32 households, 134 persons
36. **Huangjia to Huangbasanzu**							
(1)	Huangjiaba	K0+960	10	0	right	12	120 households, 470 persons
(2)	Old village	K2+100	10	0	right	4	30 households, 161 persons
(3)	Tianjia ditch	K3+200	50	0	right	7	37 households, 191 persons
37. **Fuxing town inn to Star bridge**							
(1)	Yanmensha ng	K2+600	15	+1	left,right	32 households	65 households, 278 persons
(2)	Aokoushan g	K3+450	18	+2	left,right	10 households	28 households, 95 persons
(3)	Mashipo	K4+550	15	+2	left,right	8 households	18 households, 61 persons
(4)	Deep water tang	K5+480	20	+2	left,right	15 households	54 households, 229 persons
38. **Shaxiyakou to Dadu bay**							
(1)	Big soil bay	K0+900	15	+1	Right side	5 households	17 households, 72 persons
(2)	Dujiawuji	K1+600	10	+1	left,right	7 households	23 households, 95 persons
(3)	Diaoba bay	K5+890	10	+1	left,right	8 households	33 households, 137 persons
39. **Nangan Village Dragon to Ranjiazhai Highway**							

(1)	Fengjia ditch	K3+400	15	+2	left,right	15 households	32 households, 131 persons
(2)	Ranjia bay	K5+300	20	+3	left,right	17 households	17 households, 73 persons
(3)	Yangjia bay	K7+700	15	+3	left,right	17 households	35 households, 153 persons
(4)	Fire-stone slope	K8+900	15	+2	left,right	20 households	40 households, 173 persons
(5)	Mountains Primary School	K10+200	50	+10	Right side		1 teacher, 15 students, 1 preschool
(6)	Daya	K10+600	10	+1	left,right	32 households	40 households, 168 persons
40. **Township government to Pengjiazhai**							
（1）	pengjiazhai	K1+100	12	0	left,right	10 households	about 18 households, 80 persons
（2）	Wangjiabazu	K1+400	12	0	left,right	8 households	about 20 households, 100 persons
（3）	Changfeng Reservoir resettlement sites	K2+200	8	0	left,right	5 households	about 20 households, 100 persons
41. **Cedar dam to Peach bay**							
(1)	Cedar dam	K0+000	50	0	left	12	90 households, 480 persons
(2)	Taojia bay	K0+142	15	0	left	9	38 households, 140 persons
(3)	Bay inside	K1+300	15	0	right	10	31 households, 140 persons
42. **Heduimen to Xintang**							
（1）	Well	K0+200	30	0	Right side		Heduimenzu 200 persons, drinking water
（2）	Sanhezu	K2+200	10	0	left,right	15	about 15 households, 60 persons
43. **Chaodi to Chenyuan**							
(1)	Well bay	K0+000	8	0	right	9	20 households, 110 persons
(2)	Big courtyard	K1+000	8	0	right	12	30 households, 162 persons
(3)	Aoshang	K2+000	10	-1	left	8	50 households, 198 persons
(4)	Chendatuo	K4+500	8	0	left	15	100 households, 523 persons
(5)	Guanjia ditch	K5+200	10	0	left	6	20 households, 112 persons
44. **Wujia ditch to Xujia hill**							
(1)	Mozi rock	K0+200	60	2	left	5	89 households, 358 persons
(2)	Xujia hill	K1+100	15	0	left,right	10	67 households, 271

						households	persons
(3)	Xiangjia	K3+100	15	+1	left,right	8	33 households, 138 persons
45. **Long beach to Yuanchang**							
(1)	chenzhuding	K1+00	10	0	right	5	15 households, 80 persons
(2)	Daoshiping	K2+400	8	0	left	11	35 households, 181 persons
46. **Xiaping to New beach**							
（1）	Yaojia	K0+500	12	0	left,right	15 households	about 30 households, 120 persons
（2）	Xiaping Primary School	K7+400	10	0	right	12	300 persons
47. **Xiajie to Shangchang ditch**							
(1)	Qingshuitang	K0+000	10	0	left	10	27 households, 115 persons
(2)	Xiachang ditch	K1+500	15	+1	right	4	11 households, 65 persons
(3)	Shangchang ditch	K2+584	8	-1	right	3	9 households, 41 persons
(4)	Old yachao	K0+855	8	0	left	4	12 households, 62 persons
48. **Horseshoe brook to Meijia**							
(1)	Yangjia	K1+800	10	0	left	5	23 households, 129 persons
(2)	Meijia hill	K3+500	10	0	right	12	41 households, 209 persons
(3)	Lijiaping	K3+500	10	0	right	9	37 households, 190 persons
49. **Lizitan to Huangjia**							
（1）	shangdong menzu	K3+400	10	0	left,right	12	about 28 households, 120 persons
50. **Lizi water to Chenjia**							
（1）	camphor tree	K1+100	8	0	left,right		2, hanging sign
（2）	Chenjiazu	K1+700	8	0	left,right	10 households	25 households, about 100 persons
51. **Horseshoe brook to Guanlin**							
（1）	Guanlinzhaizi	K2+150	10	0	left,right	15 households	about 25 households, 100 persons
52. **Zhoujia to Huangbayan**							
(1)	Zhoujia	K1+190	80	+5	left	5	36 households, 148 persons
(2)	Yujia	K1+190	100	+10	right	6	42 households, 89 persons
53. **Tujia to Zhuangyan**							
(1)	Guan Village	K1+500	10	0	left	18	50 households, 220 persons
(2)	Zhaojia hill	K0+335	10	0	left	15	60 households, 310 persons
(3)	Backflow water	K5+600	100	0	left	10	30 households, 160 persons
(4)	Taxus	K0+400	10	0	left		1, No. 46

	chinensis						
54. **Real estate board to Fassula**							
(1)	Wajiaotou	K0+000	6	0	left,right	60 households	179 households, 670 persons
55. **Yellow dam Primary School to Qi dam**							
(1)	Yellow dam Primary School	K0+000	10	0	left		teachers : 20，students :215，grade 1-6, preschool
(2)	Shop	K0+000	10	0	right	4	12 households
(3)	Ma'anshan	K0+800	20	0	right	7	15 households
(4)	Qijiaba	K1+600	15	0	right	12	30 households, 245 persons
(5)	Renjiaba	K2+300	20	0	right	11	42 households, 320 persons
(6)	Yanmentou	K3+412	10	0	right	15	46 households, 360 persons
56. **Ganxi bridgehead to Aojia**							
（1）	Lanmudong	K0+900	8	0	left,right	10 households	about 18 households, 80 persons
（2）	Sanjiatian	K2+000	8	0	left,right	8 households	about 20 households, 100 persons
（3）	Sheng dam	K4+700	8	0	left,right	5 households	about 20 households, 100 persons
（4）	Wangjiatuo	K5+760	5	0	left,right	12 households	about 35 households, 120 persons
57. **Big river to Dragon brook**							
(1)	Big river bank	K0+300	15	0	left,right	10	50 households, 221 persons
(2)	Majiaping	K2+300	10	0	left,right	15	35 households, 145 persons
(3)	Shijia hill	K3+900	30	+2	left	9	33 households, 136 persons
(4)	Yantou dam	K5+450	25	0	left,right	11	38 households, 151 persons
(5)	Dragon brook	K6+600	20	+2	left,right	15	78 households, 312 persons
58. **Fenglin to Qingqiu Village**							
(1)	Tea tree	K0+000	8	0	left	9	30 households, 150 persons
(2)	Shangzhai	K1+800	10	0	right	12	50 households, 200 persons
(3)	Zhoujia	K2+900	10	0	right、right	7	45 households, 220 persons
59. **Yanshang to Mine**							
(1)	Yellow mud slope	K6+200	10	0	left,right	6 households	21 households, 49 persons
(2)	Monk yan Village	K8+440	10	0	left,right	8 households	about 20 households, 83 persons
II. Sinan County							

60. Wengwen to Tun hill							
(1)	Tunshan Village	K0+800	8	0	left,right	about 18 households	about 50 households, 200 persons
(2)	Liaojia hill	K2+500	8	0	left	about 8 households	about 15 households, 60 persons
(3)	Yanjia hill	Branch 1 K2+700	15	0	left,right	about 10 households	about 25 households, 100 persons
(4)	Shijiaao	Branch 2 K3+100	15	0	left,right	about 12 households	about 30 households, 120 persons
(5)	Yangjiawuji	K3+750	10	0	left,right	about 8 households	about 40 households, 160 persons
(6)	Dangcao	Branch 3 K3+500	10		branch3 terminal	about 5 households	about 50 households, 200 persons
61. Paotong tree to Great bay							
（1）	Luojia dam	K1+600 branch 1	6	0	left	about 13 households	about 30 households, 120 persons
(2)	Great bay	K2+300	8	0	left,right	about 10 households	about 25 households, 100 persons
(3)	Caojiaping	K3+200	10	0	left	about 5 households	about 15 households, 60 persons
(4)	Cherry bay	K5+900	10	0	right	about 8 households	about 15 households, 60 persons
(5)	Xiangjiazhai	K7+000	10	0	left,right	about 12 households	about 20 households, 100 persons
(6)	Gaojiazhai	K8+000	8	0	left,right	about 10 households	about 30 households, 120 persons
(7)	Longshan Village	K9+100	10	0	left,right	about 8 households	about 15 households, 60 persons
62. Weng brook to Three stars							
（1）	Fascine dam village	K3+750	6	0	left,right	about 30 households	about 30 households, 120 persons
(2)	Datu village	K4+950	8	0	left,right	about 25 households	about 45 households, 180 persons

(3)	Fujiazhai	K7+350	10	0	left,right	about 20 households	about 80 households, 320 persons
(4)	Fujiazhai Primary School	K7+600	5	0	left		220 students, 10 teachers
(5)	Dinglaozhai	K9+650	10	0	right	about 15 households	about 38 households, 150 persons
(6)	Huangtong dam	K11+500	15	0	right	about 30 households	about 42 households, 150 persons
(7)	Shajia dam	K12+100	8	0	right	about 15 households	about 32 households, 120 persons
(8)	Three stars street	K12+650	10	0	left,right	about 20 households	about 80 households, 320 persons
(9)	Three stars Primary School	K12+900	30	0	right		300 students, 20 teachers
63. Wengsan highway to Alliance							
（1）	Zhangjia bay	K2+500	6	0	left,right	about 20 households	about 34 households, 150 persons
(2)	Well dam	K3+350	8	0	right	about 25 households	about 40 households, 180 persons
(3)	Zhushan Primary School	K3+500	10	0	left	School gate	School about 130 persons, 6 teachers
(4)	Muddy well	K4+100	10	0	left,right	about 15 households	about 40 households, 170 persons
(5)	Xiagantianao	K4+850	10	0	left,right	about 10 households	about 20 households, 80 persons
(6)	shanggantianao	K5+700	10	0	left,right	about 8 households	about 30 households, 120 persons
(7)	Alliance Primary School	K7+500	10	0	right	In the village	about 80students, 6 teachers
(8)	Changwujian	K8+400	10	0	left,right	about 8 households	about 15 households, 60 persons
(9)	Big house	K9+450	8	0	left,right	about 5 household	about 25 households, 100 persons

						lds	
(10)	Chinese sweet gum	K8+200	10	0	right		1 ancient tree has been hang tag
64. Jujube ping to Yellow mud field							
（1）	Wangjia ditch	K0+600	6	0	left	about 12 households	about 40 households, 160 persons
(2)	Shengjiaju	K2+400	8	0	right	about 26 households	about 50 households, 200 persons
(3)	Big well ditch	K4+100	10	0	left	about 12 households	about 20 households, 80 persons
65. Weng brook town government to Expedition							
(1)	Kezhai	K0+400	6	0	left	about 12 households	about 50 households, 200 persons
(2)	Xiejiazhai	K1+500 Branch 1	8	0	right	about 10 households	about 50 households, 200 persons
(3)	Pear tree slope	K1+700	15	0	right	about 8 households	about 40 households, 160 persons
(4)	Courtyard dam	K4+400	10	0	left	about 12 households	about 30 households, 120 persons
(5)	Black peach ping	K0+340 Branch 3	15	0	right	about 20 households	about 40 households, 160 persons
66. Three stars to Shang dam							
(1)	Pear zhai	K0+300	6	0	left,right	about 12 households	about 50 households, 200 persons
(2)	Downstream zhatang	K0+486 Branch 1	8	0	left,right	about 10 households	about 50 households, 200 persons
(3)	Upstream zhatang	K4+350	15	0	left,right	about 8 households	about 40 households, 160 persons
(4)	Youzhatang	K5+550	10	0	right	about 12 households	about 30 households, 120 persons
(5)	Ganjiazhai	K7+500	15	0	left,right	about 20 households	about 40 households, 160 persons

67. Wengsan highway to Tangjia dam							
(1)	Tangjia dam	K0+400	6	0	left,right	about 15 households	about 32 households, 200 persons
(2)	Yellow mud ditch	K1+950	8	0	left,right	about 5 households	about 18 households, 75 persons
(3)	Fujia hill	K3+500	10	0	right	about 12 households	about 30 households, 120 persons
68. Yanmenkou to Three stars							
(1)	Big courtyard	K0+650	6	0	left,right	about 15 households	about 40 households, 160 persons
69. Tangben highway to Antang							
(1)	Donglin bay	K0+550	6	0	right	about 10 households	about 22 households, 100 persons
(2)	Xiayujiazhai	K1+450	8	0	left	about 12 households	about 40 households, 160 persons
(3)	Willow tang	K3+650	10	0	left,right	about 15 households	about 20 households, 100 persons
(4)	Yellow mud village	K4+300	10	0	left,right	about 10 households	about 30 households, 120 persons
70. Aijia hill to Xinming							
(1)	kuliantang	K1+100	6	0	left,right	about 13 households	about 30 households, 120 persons
(2)	Dragon and phoenix toft	K2+500	8	0	right	about 10 households	about 15 households, 60 persons
(3)	Paddy field ditch	K3+900	10	0	left	about 5 households	about 45 households, 180 persons
(4)	Xinmin Primary School	K4+450	10	0	Left side direction	about 8 households	about 250 persons
(5)	Xiazhai village	K4+900	10	0	left,right	about 12 households	about 50 households, 200 persons
(6)	Cold water well	K6+550	8	0	left	about 10 households	about 30 households, 120 persons

(7)	Hejia dam	K6+850	10	0	right	about 8 households	about 30 households, 120 persons
(8)	Oil pressing room	K9+350	6	0	left,right	about 12 households	about 20 households, 80 persons
71. Yongxin to Ma pool							
(1)	Yongxing Primary School	K0+000	50	0	right in front		25 teachers, 450 students
(2)	Three water Chinese and western medicine hospital	K0+000	8	0	Right side		25 beds, about 100 persons
(3)	Yuanjiazhai	K0+200	6	0	left,right	about 15 households	about 50 households, 200 persons
(4)	Ma pond	K1+200	8	0	left	about 10 households	about 40 households, 160 persons
(5)	Big bay	K3+400	10	0	right	about 12 households	about 30 households, 120 persons
(6)	Shimen ditch	K3+450	10	0	left	about 8 households	about 25 households, 100 persons
(7)	Houwo	Branch 2 K0+250	10	0	right	about 12 households	about 25 households, 120 persons
(8)	Land ao	Branch 3 K0+650	8	0	right	about 10 households	about 80 households, 240 persons
(9)	Shiping	Branch 4 K0+600	10	0	left,right	about 8 households	about 20 households, 80 persons
72. Tangben highway to Double river							
(1)	Anjia dam	K0+600 Branch 1	6	0	left,right	about 15 households	about 30 households, 120 persons
(2)	Xiaojialing	K0+300 Branch 4	8	0	left	about 10 households	about 20 households, 80 persons
(3)	Pear ping	K3+850	10	0	right	about 12 households	about 30 households, 120 persons
(4)	Mengjiayan	K1+000 Branch	10	0		about 8 household	about 20 households, 100 persons

		3				lds	
(5)	Old house	K6+000	10	0	right	about 12 households	about 20 households, 100 persons
(6)	Shangzhai	K8+300	8	0	left,right	about 10 households	about 30 households, 120 persons
73. Donghua village to Donggua brook							
(1)	Donggua brook	K0+000	10	0	right	15	70 households, 350 persons
(2)	Shijia ditch	K1+500	10	1	right	6	35 households, 135 persons
(3)	Small sand brook	K3+400	8	0	right	5	16 households, 50 persons
(4)	Ta brook	K4+800	10	+1	left	7	40 households, 200 persons
(5)	Hujia	K6+500	10	+1	right	6	35 households, 180 persons
74. Zhangting highway to Liangtian							
(1)	Hejia hill	K0+000	10	-1	left	8	37 households, 210 persons
(2)	Gangzidou	K1+800	6	+1	right	7	42 households, 250 persons
(3)	Tongjing	K2+700	6	+1	right	8	50 households, 260 persons
(4)	Liangtianba	K4+475	6	+1	right	17	140 households, 600 persons
(5)	Liangtianba Primary School	K4+475	20	+1	right		3 teachers, 50 students , grade 1-2
75. Zhangting highway to Baowei							
(1)	Xiangwan Primary School	K0+000	100	+10	right		10 teachers, 125 students, grade 1-6
(2)	Sujiazhai	K2+000	150	+100	right	9	74 households, 316 persons
76. Baiyangping to South hill							
(1)	Wujiaping	K1+400	10	0	left,right	about 15 households	about 30 households, 120 persons
77. Lancaocha to Meizibao							
(1)	Laowuji	K3+200	10	0	left,right	about 10 households	about 20 households, 80 persons
78. Long hill to Tea brook							
(1)	Zhangjiapo	K0+300	20	+5	left	5	16 households, 65 persons
(2)	Big courtyard	K3+100	50	+2	left,right	7	25 households, 112 persons
(3)	Tian village	K3+700	80	0	right	12	58 households, 300 persons
(4)	Tea brook ditch	K5+200	50	0	left	9	25 households, 110 persons

(5)	Houzhaiping	K5+600	50	+5	left	6	16 households, 65 persons
(6)	Tea brook Primary School	K5+250	100	+5	left		8 teachers, 230 students, grade 1-6
(7)	Dengcao pool	K8+400	50	+5	left	11	28 households, 140 persons
(8)	Snake well	K8+900	10	+5	left	6	26 households, 135 persons
(9)	Fire-stone strip	K10+800	50	+5	left	9	32 households, 140 persons
(10)	Wachang bay	K0+800 Branch 1	15	+1	right	7	29 households, 140 persons
(11)	Small luoyin	K3+000 Branch 1	30	0	right	8	25 households, 105 persons
79. Shangguanqing to Langan							
(1)	Lijiazhai three groups	K0+300	10	0	right	20	108 households, 447 persons
(2)	Xylosma ancient trees	K0+480	3.5	0	left,right		4, Mengzi, Fengxiang, average DBH is 0.47m, average tree height is 10m, average tree-age is above 200 years
(3)	Lindera megaphylla ancient trees	K4+300	4	-1	left		12, Lindera megaphylla (pig shit nan), average DBH is 0.66m, average tree height is 15m, average tree-age is above 150years
(4)	Pengjiazu	K4+500	10	0	left,right	10	58 households, 271 persons
(5)	Dapingshangzu	K5+600	10	0	left,right	10	38 households, 159 persons
(6)	Masson pine ancient trees	K5+800	6	-1	left		2, masson pine, average DBH is 0.42m, average tree height is 18m, average tree-age is above 100 years
(7)	Cedarwood ancient trees	K6+220	5	0.5	left,right		7, cedarwood, masson pine, China fir, average DBH is 0.4m, average tree-height is 14m, average tree-age is above 100 years
(8)	Shanggongqingzu	K8+100	10	0	left	20	51 households，205 persons
(9)	Nanmu ancient trees	K8+300	3.5	-1	left,right		39, Nanmu, cedarwood, mengzi, average DBH is 0.76m, average tree-height is 14m, average tree-age is above 300 years
(10)	Old nanmu	K8+410	4500		southeat	Old nanmu locates in Gaozhuang temple village of Qinggangpo town,	

						the tree-age is about 1300 years, the tree-height is 25m, DBH is 2.8m, it is honored as "NanmuKing in Guizhou"	
80. Zhangting highway to Jinggang							
(1)	Xinzhai	K0+300	10	+2	right	5	Xinzhai 35 households，160 persons
(2)	Cypress	K0+300	8	-1	right		5 cypresses with tag
(3)	Lengfan slope	K0+400	8	+3	right	3	42 households，250 persons
(4)	Jinggang village Primary School	K0+400	15	+1	right		6 teachers , 150 students, preschool, grade 1-6
(5)	Sun rock	K2+500	8	0	left	10	120 households, 720 persons
(6)	Guazilu	K1+200	8	+2	right	8	36 households, 170 persons
81. Cold well to Guankou							
(1)	Taojiazhai	K0+300	10	0	left,right	about 15 households	about 50 households, 200 persons
(2)	Moxi Primary School	K1+200	15	0	left		about 150 persons（primary school）
(3)	Lijiagou	K5+200	20	0	left,right	about 20 households	about 45 households, 180 persons
(4)	Crystal Primary School	K5+200	20	0	left		about 100 persons
(5)	Jintuo village	K5+850	10	0	left,right	about 12 households	about 50 households, 200 persons
(6)	Yin-yangping	K8+400	10	0	right	about 8 households	about 25 households, 100 persons
(7)	Fengjiazhai	K11+400	10	0	right	about 12 households	about 50 households, 200 persons
82. Mud brook to Ca'er							
(1)	Dawuji	K0+000	200	+3	left	5	70 households, 360 persons
(2)	Ca'er Primary School	K0+000	50	0	right		23 teachers, 360 students , grade 1-6
(3)	Patio dam	K1+300	10	0	left	15	78 households, 390 persons
(4)	Peach rock	K4+500	10	-1	right	5	15 households, 80 persons
(5)	Stone-horse water	K6+400	8	+1	left	8	18 households, 92 persons
(6)	Youmu	K7+719	8	0	right	15	81 households, 410

	water	.3					persons
(7)	Stone bridge	K1+000	10	+1	left	5	25 households, 130 persons
(8)	Xujia hill	K1+500	8	0	right	12	70 households, 400 persons
83. Pujia ditch to Big hill							
(1)	Zhangjia slope	K1+000	100	+2	left	5	18 households, 98 persons
(2)	Pujia ditch	K2+000	10	0	left	12	75 households, 379 persons
84. Dongqingao to Dongjia bay							
(1)	Xiejiaao	K0+000	100	+2	left	6	13 households, 60 persons
(2)	Dang ditch	K0+216	20	+2	right	4	13 households, 67 persons
(3)	Wharf	K0+572	100	+1	right	5	12 households, 60 persons
(4)	Big stonepits	K0+600	35	+1.5	right	7	30 households, 120 persons
(5)	Shangzhai	K2+100	200	+3	right	9	75 households, 320 persons
(6)	Salt well Primary School	K2+200	20	0	right		17 teachers , 300 students, grade 1-6
(7)	Liujiazhai	K2+612	200	+2	left	12	42 households, 170 persons
(8)	Zhaojia ditch	K3+500	100	+1	left	9	35 households, 130 persons
(9)	Yangque rock	K5+595	50	+2	right	5	24 households, 100 persons
85. Qinglongzui to Zhugua brook							
(1)	Lijia	K0+500	2	0	left	9	26 households, 132 persons
(2)	Jiangjiadaping	K1+400	100	-1	right	12	47 households, 270 persons
(3)	Loquat well	K1+600	3	+2	right	15	47 households, 270 persons
(4)	Wa dragon bay	K2+600	100	+2	right	9	52 households, 263 persons
(5)	Majia bay	K3+600	200	+2	right	8	25 households, 123 persons
(6)	Macroslope	K6+200	300	+2	right	9	27 households, 125 persons
86. Liangtian to Shanxing							
(1)	Yangjiazhai	K0+000	100	0	left	5	40 households, 208 persons
(2)	Tudiao	K3+000	50	0	left	6	28 households, 140 persons
(3)	Walnet tree	K3+700	30	0	left	6	55 households, 280 persons
(4)	Juanziao	K5+000	20	0	right	5	20 households, 98 persons

Note: * Left and right are in the direction from the starting point to the terminal point, centering on the road.

4. Environmental Impact Assessment and Mitigation Measures

4.1 Social Environmental Impact Analysis & Assessment and Protection Measures

4.1.1 Social Environmental Impact Analysis & Assessment

4.1.1.1 Regional Social and Economic Development Program

(1) Tongren

Tongren is striving to take full advantage of the "twelfth five-year" period and achieve the best and fastest economic as well as social development since the reform and opening up. It will make an overall consideration about the future development trend and condition, and make full effort to realize the following major objective of economic and social development: keep rapid economic development. Till 2015, the GDP annual average increase reaches to 17%, 65 billion RMB. The target is to create an annual average increase over 19%, which is 1.5 times of 2010, and break through 74 billion RMB; the per capita GDP over 17 thousand; general financial revenue annual average increase over 25%, and break through 10 billion RMB; the investment annual average increase of whole society fixed asset over 35%, and break through 100 billion RMB, which is quadruple; the annual average increase of whole society total retail sales of consumer goods over 25%, twice than 2010 and strive to break through 24 billion RMB; the annual average increase of investment promotion capital over 40%, four times of 2010 and strive to break through 60 billion RMB.

Achieve major breakthrough on structure adjustment. It aims to achieve annual average increase of over 7%, 27.5% and 16% respectively in the primary, secondary and tertiary industry. Till 2015, the annual average increase of industrial enterprises above designated size is planned to reach over 25%, striving to over 30%. The proportion of industrial added value in total GDP is planned to improve to around 35%, and the secondary industry takes up the proportion in total GDP from 26.3% in the end of "eleventh five-year" to above 40%; the non-public ownership economy is planned to take up 60% in total GDP; the tourism total revenue is planned to reach 18 billion RMB, annual average increase above 24%.

Coordinate development of urban and rural region. The urbanization annual average of the entire region is planned to improve 2% and reaches above 40%; the urban GDP is planned to take up 75% of the total GDP; the transfer employment of rural labor force is planned to reach over 0.4 million.

(2) Dejiang county

Dejiang county takes Deng Xiaoping Theory and "Three Represents" ideology as the guideline, carrying out scientific development perspective deeply. Since 2011, Dejiang county sticks to the idea of "strengthening foundation, encouraging industry, striving increase, promoting stability and ensuring people's livelihood" to program the construction work. It follows tightly the main keynote of "two increases and one promotion", insists to put program the first, and takes the completion of basic facilities construction as emphasis and people's livelihood project construction as mainline, in order to drive the urban and rural program and construction management, as well as the construction of key projects, and accomplish every work successfully. Dejing county will put forth effort to push the economic structure strategic adjustment, and highlight the support to the development of pillar industry, featured advantageous industry as well as agriculture industrialization. Till the end of "twelfth five-year", the three times industrial structure adjustment is 22.8:42.1:35.1, and the annual average increase of the primary, secondary and tertiary industry is 8.7%、45.5% and 18.6% respectively; the secondary industry takes up over 40% among the GDP; the gross output of grain is kept above 0.17 million tons stably.

(3) Sinan county

Main objectives during "twelfth five-year": firstly, to improve the comprehensive strength substantially. Sinan county aims to significantly speed up the development step and sustainably improve the economic efficiency. The county GDP annual average increase is planned to reach 20%, and striving to reach 21%. Till 2015, the expected GDP will be 10.5 billion RMB, the expected per capita GDP over 15 thousand RMB, almost 2.5 thousand USD, which is close to the provincial average development level. The expected annual average increase of financial revenue is above 30%, and surpasses 1 billion RMB in 2015. Secondly, to optimize the economic structure continuously. It aims to speed up the secondary industry, and improve the quality of the tertiary industry as well as the efficiency of the primary industry. The planned annual average increase of primary, secondary and tertiary industry is respectively 10%, 40% and 20%, leading to a more prominent "secondary, tertiary and primary" type of structure. Till 2015, the planned annual average increase of total industrial output value is over 52%, and the industrial added value is expected to take up about 35% among the overall GDP. The three times industrial structure

optimization is 19：43.8：37.2, and the leading role of industrial economy is further highlighted.

4.1.1.2 Affected Area and Beneficial Area of the Project

1. Affected area of the project

The direct affected areas of the project are Dejiang county and Sinan county of Tongren. According to survey, the project requisition of land affects 2 counties, 35 rural towns, and 157 villages. Among, there are 21 rural towns (or subdistrict office) and 120 administrative villages in Dejiang county are affected by the project requisition of land; there are 14 rural towns and 37 administrative villages in Sinan county are affected by the project requisition of land.

2. Beneficiary area of the project

The direct beneficiary areas of the project are Dejiang county and Sinan county in Tongren, and the indirect beneficiary areas of the project contain other districts (counties) of Tongren, as well as Zunyi, Qiandongnan autonomous states and etc. according to survey, the project construction will directly benefit 21 rural towns and 134 villages in Dejiang county, 14 rural towns and 59 villages in Sinan county, 1 rural town and 2 villages in Wuchuan county, Zunyi. The directed beneficiary population reaches about 0.3336 million, which takes up the proportion (beneficiary population in rural town total population) of 35.10%.

4.1.1.3 The Social Effect of the Project

After evaluation analysis of *Social Impact Assessment Report* of the project, it suggests that the Tongren rural road project has wide and long-range social effect. It will bring development opportunity for the local place. The social effect of the project includes short-term social effect and long-term social effect.

1. The direct and short-term social effect of the project

(1) It provides convenience for residents to go to school, see doctors and go shopping, and this change the difficulty of going out.

(2) It eliminates the original potential safety hazards of various curves and sharp slopes, changes the situation of heavy mud in rainy days and dust in sunny days, and improves the rural environment.

(3) It improves the transportation condition of product, so that it is possible to transport timely the agricultural products as well as local resources at a low cost, and import means of production and consumption.

(4) It promotes the development of non-agricultural industries such as local tourism resources, transportation, business trade and agricultural product processing, opening up new income source of the local residents.

(5) It promotes the communication of personnel and elements between rural and urban people, and creates condition for the importing of external capital into rural areas.

(6) It improves the living quality of farmers and enhances their sense of happiness.

2. The indirect long-term social effect of the project

(1) The project is helpful to reduce the cost of children going to school, and thus reduce the phenomenon of quitting school. In the long run, it will perfect the population structure of the local villages, improve the quality of population, increase the human capital, and thus lay the foundation for transformation and development of the local society.

(2) The project provides convenience for the local residents to go out. This can reduce both the economic and strength burden of farmers, improve the local environment, eliminate the potential safety risks and finally improve the living quality and sense of happiness of the local residents.

(3) The project can improve the trading condition for the local farmers, and increase the agricultural efficiency as well as the income of farmers. It also creates conditions for the development of non-agricultural industries like tourism, agricultural product processing and etc. These will greatly promote the agricultural modernization.

(4) The project can contribute to remove the natural barrier which impedes the flowing of urban and rural personnel as well as elements. It will make the economic connection of urban and rural areas close, remove the traffic barrier for urban capital entering into villages, and thus promote the development of urban and rural integration.

(5) The project can promote the intra-regional as well as inter-regional association. This will help to open up the view of farmers, change their ideas, and speed up the progress of local society modernization.

(6) The project can accelerate the communication between every nationality, which is help for the harmonious development and national fusion of the local society.

4.1.1.4 The Potential Social Risks of the Project

Based on investigation, interview and analysis, the project office regards that the

project implementation confronts some potential social risks. Nevertheless, those social risks can be avoided and solved. The main potential risks include:

(1) Whether the project construction can be executed and accomplished on schedule is the most concerned issue of the local residents. In case the project construction delays, the construction disturbance to the production and living of local residents will be too long. And this can easily cause the dissatisfaction of public to the local government.

(2) The quality of project construction is the focus issue widely concerned by the local public. In case the construction quality is not good, the local residents will suffer the heaviest loss. This might causes the residents obstruct construction.

(3) The compensation standard of land requisition is the vital issue concerned by local public. In the past, when Dejiang and Sinan counties build rural road, they adopt the way of donating land by community resources. The village committee coordinates and donates land needed for building road, and no compensation is given by government. However, in recent years, the voice of requesting land requisition compensation is higher and higher. In order to protect the legal rights and interests of affected population, this project will compensate for land requisition. But this will possibly trigger the farmers who previously donated their lands for rural road construction voluntarily to ask for compensation. This might cause social conflict.

(4) During the land requisition compensation, if any phenomenon of information in-transparency or injustice, it will cause conflict and contradiction between public.

(5) After the accomplishment of project, if the damaged rural irrigation facilities are not recovered on time, and the original branch roads are not connected with the newly constructed roads, it will lead to the dissatisfaction of farmers and cause new contradictions and conflicts.

(6) If the project resettlement of inhabitant is lack of female participation, this might fail to guarantee the legal rights and interests of female and bring the problem of gender inequality.

(7) The impact of foreign constructors to local residents: the entire construction period of the project will last for 3 years. Except for hiring local constructors, a part of foreign workers will also take part in the construction work. During the project construction, if the project managers and construction side perform ill management, and not respect the local national customs, it might cause conflict between

construction team and local residents.

(8) If the particular requirements of disadvantageous group affected by the project are not considered during the resettlement plan, or no special supportive policy provided, this might make the recovery of their production and living to be extremely hard.

(9) When the roads are finished, the traffic flow and speed will be increased. The local residents are lack of safety awareness, so there is risk of heavy traffic accident rate increase.

After evaluation, the above potential social risks are possible to be avoided and solved. As long as effective measures are adopted during the project planning and implementation, those can be avoided and the project can be implemented smoothly.

4.1.1.5 Impact to the Public Facilities

1. Local traffic

Due to the project implementation is basically construction and extension on the original road, the original traffic will be directly affected significantly during the bridge construction period, and the traffic pressure of nearby road will be greatly increased. This can be relieved by reasonable arrangement of construction time. In addition, the traffic functional department should be involved to dredge traffic, so as to decrease the traffic congestion caused by construction to the largest extent and decrease the disturbance to normal traffic of the public in construction area.

When the project finished and put into operation, it will improve the structure, pavement quality and traffic congestion situation of rural road. Also, it will perfect the safety facilities of rural road and eliminate the potential safety risks gradually. It is to create good traffic condition for building a well-off society in an all-round way, so that it can better adapt to the rapid development of economic society and provide convenience for the production and living to the vast farmers. In this way, it can improve the living standard of farmers and make contribution to the construction of new socialist countryside.

2. Public facilities along the line

During the project construction, there might be affected public facilities like power line, telephone wire, road, canal, ditch and other various kinds of underground pipelines. The type and quantity of affected infrastructures are shown in table 2.5-2. The project resettlement office is responsible for the communication and negotiation with the public facility possessor. It is in charge of formulating specific reconversion

plan, so as to enable these affected infrastructures to be recovered and rebuilt as soon as possible. If the compensation is in the way of currency, it should be delivered in time and assist to coordinate relevant departments to recover the above facilities of power, communication and traffic timely.

4.1.1.6 The Impact to Cultural Heritage

Based on field investigation, data collection and verification documents (see attached) provided by local administrative department of the two projects, there is no cultural heritage site or culture relic protection site within the land occupation range of Guizhou rural development project. Still, a stone horse sculpture is discovered 20m to the left side of road section "Hetou to Dayuan"in Quankou village, Dejiang county, which is a natural relic. According to the record of *Jiajing Sinanfu Records,* it is one of the Ten Views of Sinanfu and Four Views of Yongzhou. As it is close to the road, it might be affected or destroyed during the construction. Therefore, in order to ensure the safety of the cultural relic, the project construction should strengthen the management and publicity, set up obvious cultural relic denote, prohibit the road extending to the left or blasting construction, or any behavior that might damage the cultural relic.

There is no other cultural relic or historic site discovered along other roads and bridges. Nevertheless, once any cultural relic is found during project construction, the field must be protected. Then it must be reported to the local cultural relic administrative department immediately. Any construction unit or individual should not conceal, loot, divide privately or hide the cultural relic. After taking effective protection measure and get the approval of cultural relic administrative department, can the construction continues.

In addition, according to the statistics of *Resettlement of Inhabitant Plan of Tongren, Guizhou Rural Road Project Financed by World Bank Loan,* it also involves the removal of 123 graves, including 82 in Dejiang county and 41 in Sinan county. Merely, these graves belong to normal people, and there is no great value of culture, archaeology and paleontology. The measures of grave removal are covered in the project separate *Ressettlement Plan,* so this environmental assessment is not going to retell it.

4.1.2 Protection Measures to the Social Environment

4.1.2.1 Mitigation Measures of Social Environment Impact during Design Phase

When designing the road route layout and comparing proposals, it should comprehensively consider the natural environment and social environment in areas along. The route should occupy the cultivated land, forest land as less as possible, and keep away from the environmental sensitive spots like important cultural relics and historic sites, water source, villagers concentration areas, natural protection areas, scenic spot areas, precious trees, ancient trees and schools. Meanwhile, it should take into consideration about the positional relation of water conservancy facilities, electric power communication, aquaculture, road and railway traffic facilities. Besides, it should reduce removal and the influence to the life of residents caused by road construction separation. Try not to gravely disturb the urban and rural program and comply with the urban and rural construction plan as well as road network construction plan. Provide convenience for every village, town, enterprise and public institution along the route to travel. Reduce the impact degree to the surrounding environment as possible as it can.

Regarding the Siyetun county-level natural protection area located in Shangguanqing to Lan'gan section, and Sanchatang bridge, in Sinan county, and the Longdijiang River scenic spot located in Qinglongju bridge, Wujiang river Bailuzhou scenic spot in Sinan county, which are recommended by the project *Feasibility Report* it requires relevant special demonstration to be approved. It should objectively and scientifically prove the impact degree of project construction and operation to the Siyetun county-level natural protection area and Longdijiang River scenic spot. It should minimum the impact to production and construct after the approval of relevant management department.

4.1.2.2 Social Environment Protection Measures during Construction Period

1. According to relevant laws and regulations of national land management law and urban housing demolition resettlement compensation rules, a series of well-organized land requisition resettlement plan should be formulated combining the migration plan of Dejiang county and Sinan couty in Tongren, in order to support eco-migration of residents along the road route. The road construction department should set up specially the land requisition and demolition office, and formulate reasonable resettlement plan. The office should take the overall interest of project construction as starting point, cooperate with the local government and relevant departments to make overall arrangement, full coordination and leave no future

trouble. According to the policy related to land requisition demolition by the people's government of Guizhou province, it should make relevant compensation and ensure the stability of affected residents' life.

2. During construction, reasonable economic compensation must be given to the loss of occupied lands of farmers. Besides, according to relevant regulations of "land management law", if farmland and vegetation are destroyed by temporary land occupation, they must be recovered as much as possible after construction accomplished. The farmland loss must be compensated, afforested and reclaimed, so as to recover the original function. The loss of farmers caused by construction can be compensated by service fee gained as temporary worker. In these ways, it is to guarantee the life stability of affected masses and realize stability and unity.

3. During construction, the construction unit should enhance connection with public security and traffic management department to rationally control the traffic flow and direction in construction section. It must well conduct traffic dispersion in order to reduce the traffic congestion degree and noise. After the construction is finished, rural roads, canals and ditches damaged during construction process must be repaired, or certain compensation cost should be paid to local government to maintain the legal benefit of civilians and local government.

4. It is suggested to take the following measures to reduce the disturbance of construction transport vehicles to residents along the route: strengthen management to the construction transport vehicles; add caps to the earthwork transport vehicles to reduce the dust on pavement; watering the transport road timely to suppress dust; stack construction materials reasonably. The main transportation shortcut (temporarily) must be away from villages, and avoid crossing or running at the same time with the existing traffic lines. The transportation distance is better to be as short as possible.

5. In order to decrease the disturbance to electric power and communication career caused by communication facilities demolition during road construction, and avoid causing severe accidents of power black out or communication break off, the design unit must negotiate with departments like electric power, post and communications and etc in advance. Only after the approval of relevant administrative department and the construction of replacement facilities can the affected infrastructures be removed.

6. The cultural relic site near the road must be protected during construction, and

the historical style of cultural relic protection site must not be destroyed. It is prohibited to fetch earth and discard earthslag within the range of cultural relic protection site. During project construction, it should enhance the cultural relic protection work possibly encounters. Once any cultural relic is discovered, the field must be well protected and reported to local cultural relic administrative department timely. Any construction unit or individual should not conceal, loot, divide privately or hide the cultural relic. After taking effective protection measure and get the approval of cultural relic administrative department, can the construction continues.

A stone horse sculpture is discovered 20m to the left side of road section "Hetou to Dayuan" in Quankou village, Dejiang county, which is a natural relic. According to the record of *Jiajing Sinanfu Records*, it is one of the Ten Views of Sinanfu and Four Views of Yongzhou. As it is close to the road, it might be affected or destroyed during the construction. Therefore, in order to ensure the safety of the cultural relic, the project construction should strengthen the management and publicity, set up obvious cultural relic denote, prohibit the road extending to the left or blasting construction, or any behavior that might damage the cultural relic.

7. There should be sanitary and medical service guarantee in the living quarters of constructors, and perfect hygienic supervision and administration measure system should be formulated. There should be construction scutcheon hung on the construction site, to indicate the project name, director, construction permit and complaint hotline to accept the supervision of people from all walks of life and residents. The construction unit should allocate 1 to 2 full time environmental protection personnel to take charge of the environmental management.

4.1.2.3 Social Environmental Protection Measures during Operation Period

1. Strengthen the road administration management. Publicize and educate the masses along the road route not to embezzle the road land to build housings. Strengthen the safety education.

2. Prohibit the vehicles which do not conform to the safe transportation regulations to hit the road.

3. The management organization of planned road should well perform the traffic safety precaution and publicity work, and ensure the traffic smooth as well as safety of people's lives and properties.

4. Complete the construction and maintenance of environmental protection

project. Coordinate the road with surrounding environment. Eliminate the pressures of masses caused by the road main construction obstruction and operation.

5. Strengthen the management of road main construction to ensure the smooth of passageway project. Provide convenience for people to travel and work.

6. It is suggested that the competent department should enhance the program of land utilization on both sides of the road, in order to ensure the coordination between urban area construction plan along the line and planned road landscape construction. Also, it is to ensure the coordination between scenic spot construction plan and planned road landscape construction. The competent department should strictly examine and approve the nature, scale and building style of constructions along the lines.

7. Strengthen the safety and fireproofing education. Set up relevant safety instructions at the dangerous sections to avoid traffic accidents. Set up forest fireproofing instructions in natural protection area and forest section to avoid fire accidents.

4.2 Impact Analysis of Inhabitant Resettlement and Environmental Protection Measures

According to the investigation and statistics of *Inhabitant Resettlement Action Plan* of the project, it will permanently occupy the total area of 104.44 hm^2, and there are total 22140 m^2 of affected removed buildings. Since the project is linetype project, although the quantities of land requisition and removed building are not huge, the affected quantities of villages, families and population are big. Based on primary investigation and statistics, the total affected family quantity is 3837, 14772 persons. Among, the affected family quantity in Dejiang county are 2829, 10650 persons; and 1008 families in Sinan county, 4002 persons. Those families are mainly affected by project land requisition. According to primary statistics, family quantity only affected by land requisition is 3758, holds 97.9% of the total affected families. And family quantity affected by both land requisition and demolition is 79, only holds 2.1% of the total number.

The immigrant demolition during project construction will be a sensitive social problem. The demolition does not only involve economic issue, but also involve the development issue of villages after demolition. *Inhabitant Resettlement Action Plan* of the project sees to the difference between national law and non-voluntary immigration resettlement policy of World Bank. The project office reflects the difference to local

government. Based on negotiation with affected population, the local government confirms some essential principles about the project immigration resettlement, following the non-voluntary immigration resettlement policy and principle of World Bank and combining the local practical situation.

(1) The project office offers valid compensation for occupied rural collective farmlands and houses calculated according to replacement cost. At least it should guarantee the immigrants to keep the living standard as before, and improved to some extent. As for occupied bare places of rural collectivity, the village committee should organize the land relocation and donate voluntarily to satisfy the rural road construction.

(2) Provide resettlement approaches for immigration economically and technically feasible. All these approaches must be negotiated with immigrants and chosen by them independently. All legal or illegal affected population should be taken into consideration within the immigration resettlement action plan.

(3) Inform all affected population timely about relevant compensation standard, livelihood recovery, income plan and project schedule. Inform all available resettlement approach choices and relevant rights.

(4) The project manager and construction unit should decrease the temporary occupied land and disturbing time to the minimum, and be responsible for recovering all destroyed irrigation facilities and original rural roads.

(5) Before signing land requisition and demolition agreement with affected, no forcible land requisition and demolition activities are allowed.

(6) If the per capita occupied land is not enough to keep livelihood, the relocation population should obtain development assistance like training, job opportunity and loan, or job providing other income source, except for compensation received.

(7) The houses and homestead provided for relocation population should have the same district advantages and potentials at least with the previous places. The relocation population should get assistance like relocation payment. After relocation, the relocated population will still be subsidized to recover livelihood and living standard based on estimated transition period.

(8) Set up efficient and transparent immigration complaint collection and process procedure to ensure problems can be solved timely during immigration

resettlement process. During project implementation period, hire external monitoring institution to monitor the immigration resettlement activities independently.

(9) Affected population should enjoy equal compensation standard regardless of their gender and nationality.

After listening to the opinions and suggestions of residents, individual households, enterprise and public institutions, the project has compiled social impact assessment report and resettlement action plan. It strictly formulates policies and operation procedures of resettlement compensation to compensate the residents, individual households, enterprise and public institutions affected by demolition and land requisition, so as to ensure the smooth carry on of road project in design phase. In the design of the next stage, it should conduct specific classifications and statistics to the demolition projects, and pay attention to land requisition, demolition and resettlement work. The road route selection should avoid farmlands, population intensive areas and schools to the greatest extent, in order to reduce the land requisition square meter and resettlement volume. As for road section which is impossible to avoid, resettlement plan must be well prepared. The project must implement the scientific development perspective before construction. It should be people oriented and jointly build a harmonious society. Based on the national guidelines, policies, laws and regulations, standards, as well as local relevant policies, regulations and standards about land requisition and demolition compensation, the project combines local national economy and actual situation of land requisition as well as demolition objects. It gives considerations to the benefits of state, local place, affected masses, enterprises and public institutions. The project strictly formulates *Land Requisition, Demolition Compensation Method and Standard* and *Demolition Resettlement Plan,* and implement under the supervision of relevant department. It assists and supports affected to guarantee their living standard to keep the same level than before after road construction finished.

The detailed *Immigration Resettlement Action Plan* prepared respectively is specifically related in this report, thus the environmental assessment is not going to retell it here.

4.3 Analysis Rating of Eco-environmental Impact and Protection Measures

4.3.1 Analysis Rating of Eco-environmental Impact

The project construction will occupy 181.84 hm^2 land. Among the occupied land, 104.44hm^2 is permanently occupied, which takes up 57.44%; 77.4hm^2 is temporarily

occupied, which takes up 42.56%. Among the permanently occupied land, 33.87hm^2 is farmland (all dry land), 2.07hm^2 is garden plot, 3.94hm^2 is forest land (shrubwood), 62.16 hm^2 is unused land and 2.4 hm^2 is construction land (the original rural road). Among the temporarily occupied land for the reason of temporary construction camps, shortcut and spoil ground during project construction, 19.3hm^2 is farmland (all dry land) and 58.1hm^2 is forestland (shrubwood). After project accomplished, they will be immediately covered by earth or greened.

4.3.1.1 Planned Project Impact to Natural Vegetation and Wild Animals

4.3.1.1.1 Impact to Vegetation

According to data collection and field investigation, native vegetation along the planned project route is no longer existed. There are mainly secondary vegetation, artificial vegetation and farmland vegetation. During construction, the excavation, fill and discard of earth will destroy and impact the original ground vegetation of construction area, and will have certain influence to the local site condition. The mainly affected are pinus massoniana forest, cypress forest, shrubwood and farmland vegetation. Yet, the planned project is located in rural area and basically utilizes the original rural road to reorganize and expand. Only a few lands are newly occupied, and a few area as well as variety is involved in construction. Therefore, the project construction will cause no any population extinction.

There are mainly rural ecosystem, forest ecosystem and farmland ecosystem these three types in the project area. The construction will occupy a part of rural residential land, forest and farmland. This will destroy partial vegetation, and change the partial areas which are forest and farmland oriented ecosystems into road oriented ecosystem, and further cause the change of specie components and quantities in the project area.

The vegetation in the project construction is mainly artificial vegetation, including some common types of dry land, paddy field, pinus massoniana forest, cypress forest, cedar forest and shrubwood. The project main impact to vegetation resources reflects in the change of local area crops and forest land layout caused by project land occupation and road obstruction. The project changes the soil layer and soil, leading to the decline of supply capacity. This gives rise to indirect vegetation destroy, vegetation productivity impairment, vegetation coverage decline and environmental function decline. The influence mainly reflects in certain decrease of total biomass, but the influence to biomass per unit area in surrounding area is not big,

neither to its function and stability. It will not cause loss to the vegetation specie. Even so, the land recovery compensation work should be concerned after project completion. The greening measure along the road route must be strengthened to minimize the impact to plant environment.

The planed project occupies 3.94hm^2 shrubwood, about 0.025‰ of the total occupied forest area 159629hm^2. During road construction, it should recover the vegetation along the line by section and by stage, and plant large quantities of arbors, shrubwood and herbals, in order to minimize the overall influence to the areas along.

In the road construction stage, it needs to excavate or fill the ground, and this will destroy the forest within the road land requisition scope. If the change is on the roadbed occupying part, then it is permanently and the vegetation can not be recovered. Ecologically, biomass refers to the total quantity of various active organisms in a community. This index is an important basis to assess the vegetation change. However, it is difficult to quantization. Thus, the assessment adopts another index, which is forest stock to reflect the change trend of this index. To estimate the forest stock in road occupied scope via calculating the forest stock in Nanming district and Huaxi district, then the forest stock decrease situation caused by road occupation is as below table 4.3-1.

Table 4.3-1 Forest stock decrease situation table in road occupation scope

Occupation area	**Occupied forest area（hm^2）**	**Forest stock per unit area（m^3/hm^2）**	**Forest stock decrease in road occupation scope（m^3）**	**Forest stock loss ratio（‰）**
Dejiang county Sinan county	3.94	41.69	164.26	0.020

From table 4.3-1, it can be seen that the forest stock decrease is about 164.26m^3, and the loss rate is about 0.020‰. Road construction occupies large quantity of land, and the vegetation biomass decrease or loss is one of its major negative impacts, which is unavoidable. Based on relevant specifications of Ministry of Communications, such as *Highway Foundation Design Specifications, Highway Roadbed Construction Technical Specifications, Highway Maintenance Technical Specifications and Highway Environmental Protection Design Specifications,* the road greening work is being strengthening in China. The greenbelt regeneration can

recover the affected vegetation by road construction to certain extent. Meanwhile, it also plans the function of protecting the roadbed, preventing the water and soil loss, purifying the air, reducing the traffic noises and beautifying the environment, and further improves the road driving environment.

Vegetations on temporary ground occupied during road construction, such as fetch and discard stone field, construction shortcut, temporary work shed and etc, can be recovered or reclaimed after road accomplished, and no big loss will be caused.

4.3.1.1.2 Impact to Animal Habitat

According to data collection and field investigation, there is no wild valuable endangered animal in the project area. However, the construction destruction to part of the vegetation, the construction noises and other activities will exert certain influence to the terrestrial vertebrates on both sides of the road in the project area. It is mainly because the blasting, machine excavation and vehicles crushing might change the landform and vegetation condition. This will result in the loss of survival and reproduction environment of partial animals nearby, and force them to move. The blasting, machine noises and human activities have certain influence to animals, and the construction materials stocking area and buildings will narrow their living space. This will force them to move around and increase the inter-population competition and hurt. If misgoverns, constructors might catch and kill animals, and thus leading to the animal number decrease. Yet, the project involved area only takes up a few part of their overall range of activity. With the finish of construction, the noise impact will no longer exist.

The road construction has certain limitation to the movement area, migratory route, inhabit area and foraging area of partial terrestrial animals. Since there is no wild animal protective are, and there are several culverts as well as bridges, the road has little influence to their migration. Besides, the project route range is not stopover station of migrant birds, so influence in this aspect is little. During construction period, the action of cutting into a mountain or filling will scare all kinds of little animals in shrubs and grasses, and some of them will move to other places. Some little animals might move back after the vegetation recovered, and become members of the new ecosystem in this area again. Thus, the project does little impact to them. As for livestock and fowls, the negative impact to them can be relieved by bridges and culverts. They can adapt to new environment and survive well, so the impact is little too.

Usually, mammals can cross the road via automobile, machinery cultivate and pedestrian passageways at night. Amphibious and reptiles can cross the road via culverts and bridges. Therefore, though the road construction has certain impact to wild animal inhabit, the degree is limited.

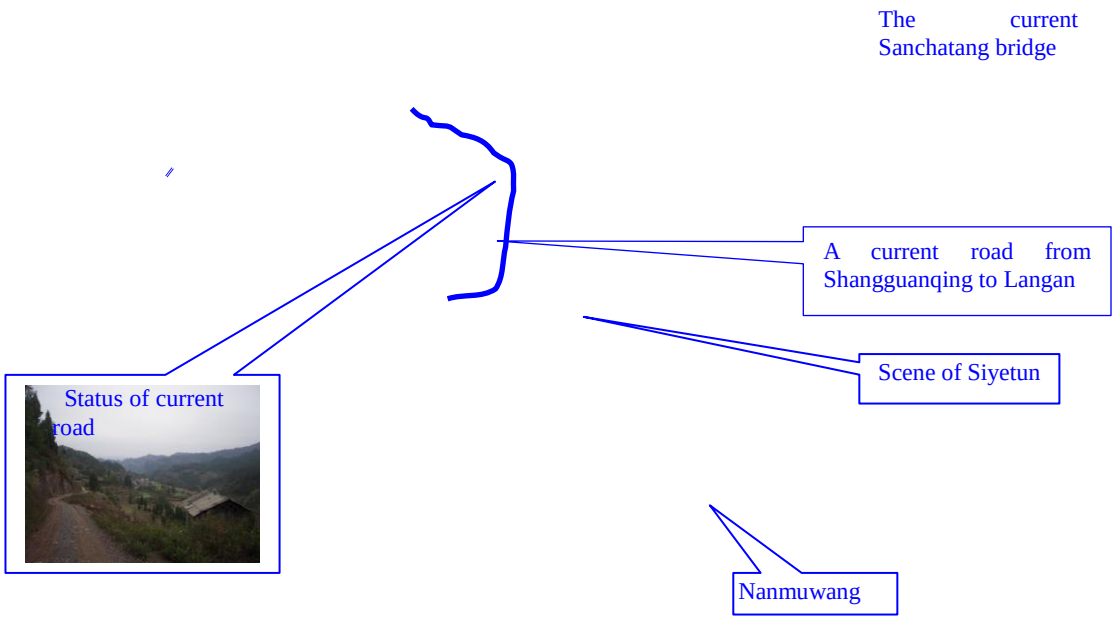
4.3.1.2 Impact to Sinan Siyetun Natural Protection Area

1. Overview

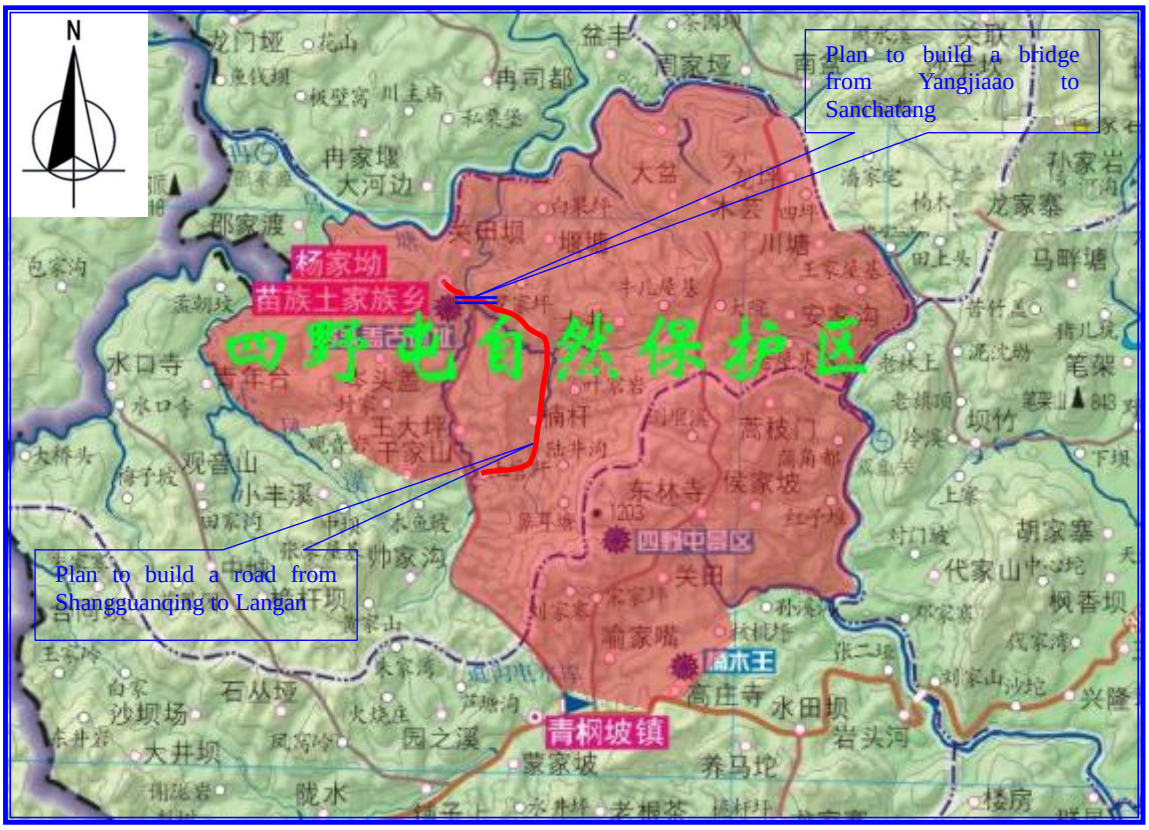
The whole line of "Shangguanqing to Langan road" in Sinan county and "Sanchatang bridge" are located in Sinan Siyetun natural protection area. The total length of "Shangguanqing to Langan road" is 8.411km (K0 + 000- K8 + 411), and the road width is 4.5m. The whole line is reorganized and expanded based on the original road. "Sanchatang bridge" is located in K1+050 of this road, the length is 35m and the width is 5.5m, as shown in figure 4.3-1. Sinan Siyetun natural protection area is county level, which is located in Yangjiaao village and Qinggangpo town, Sinan county. Its total area is 2859hm^2, and the forest coverage is 29.8%. The major protective objects are forest and wild animals as well as plants. The protection type is forest ecology. It is established by the approval of Sinan Forestry Bureau in 1999. The relation between planned project and protection area is as figure 4.3-1 shows.

In the protection area, there are hundreds of national second level wild animals such as Reeves's Pheasant, chrysolophus pictus, chrysolophus amherstiae, Lophura nycthemera, forest musk deer, Manis pentadactyla, zibet, rasse, otter, goral, blue sheep, barn owl, Eurasian eagle owl, egret and so on. In the underground river of Myriad Buddha Hole, a white and transparent little fish is discovered, which is named as transparent fish by local masses.

There is a 1,300 years old nanmu grows in Tujia habitation, Gaozhuangsi village, Qinggangpo town, within the protection area. The height of the tree is 25m, and the diameter at breast height is 2.8m. Its crown coverage covers about 0.1 hectare land and is honoured as "the king of nanmu in Guizhou". There are another 12 nanmu with diameter at breast height of 1-2m, and the closest distance from Shangguanqing to Langan road is 4.5km. There are national secondary protection trees distributed sporadically within the protection area, like beech and gingko. Among, the beech is the biggest with the height of 22m and diameter at breast height of 2m.



（1） Sketch map of Sinan Siyetun Nature Reserve and the existing Road of Shangguanqing-Langan, Sanchatang Bridge



（2）Sketch map of the proposed Road of Shangguanqing-Langan, Sanchatang Bridge in Sinan Siyetun Nature Reserve

Figure 4.3-1 the relational schema of the proposed project and Sinan Siyetun

Nature Reserve at county level

2．Impacts on the vegetation and ancient trees

According to the on-site investigation and collected data of such relevant departments as Forestry Bureau of Sinan County, within the 200m around the two sides of "the proposed road of Shangguanqing to Langan", K0+000-K0+800 is the village ecological system, with the distribution of villages, villagers, scattered forest, Chinese oak group and so on; K0+800-K2+600 is covered by dry land, farmland, vegetation and scattered shrub vegetation; K2+600-K2+800 is artificial Lombardy poplar vegetation and scattered shrub vegetation; K2+800-K4+200 is dry land, farmland vegetation and scattered shrub vegetation;K4+200-K4+800 is the village ecological system, with the distribution of villages, villagers, scattered forest , the ancient tree group of lindera megaphylla and so on；K4+800-K5+400 is the dry land vegetation and scattered shrub vegetation；K5+400-K5+750 is the village ecological system, with the distribution of villages, villagers and scattered forest ； K5+750-K6+300 is dry land vegetation, scattered shrub vegetation and such ancient tree groups of Chinese red pine and cypress; K6+300-K7+900 is dry land vegetation, Chinese red pine, Chinese fir forest preparation, scattered shrub vegetation and so on; K7+900-K8+300 is village ecological system, with the distribution of villages, villagers, scattered forest, phoebe zhennan group and so on; K8+300-K8+410 is paddy field, dry land field, scattered cypress group and so on. Besides, at the Gaozhuang Temple Village of Qinggangpo Town, which is 4500m far away from the southeast of the end point （K8+410）of the project an ancient, there is an ancient phoebe zhennan praised as "the king of phoebe zhennan of Guizhou". In the whole line of the proposed "road of Shangguanqing to Langan" and the evaluation area of "Sanchatang Bridge", the detailed distribution of the ancient and famous trees is in the following table 4.3-3.And part of the photos of the ancient and famous trees can be seen in the attached picture 3.5-2. In accordance with the current Wild plants protection regulation of the People's Republic of China (1999), Technical Regulations of Survey and Filing of National Ancient and Rare Trees and other relevant regulations as well as the classification standard of ancient and rare trees (see Table 4.3-2), it can be confirmed that there are 3 kinds of ancient and rare trees in the evaluation area of the project. They are First, Second and Third Grade State Protection trees.

Table 4.3-2 the grading standard in Technical Regulations of Survey and Filing of National Ancient and Rare Trees

Grade of ancient tree	Age of a tree	Remarks
First Grade State Protection trees	More than 500 years	Real age, estimated age or legend age
Second Grade State Protection trees	300-499 years	Real age, estimated age or legend age
Third Grade State Protection trees	100-299 years	Real age, estimated age or legend age

Table 4.3-3 Distribution list of the ancient and rare trees in the evaluation area of the proposed project

Serial No.	Name of the sensitive spot	Stake mark in the middle	Closest distance to the central line（m）	Dispersion（m）	Direction	Overview of the sensitive spot	Protection grade
1	Ancient tree group of Chinese oak tree	K0+480	3.5	0	Left & right	4 trees, lemon, sweetgum, average DBH of 0.47m，average height of 10m,average age of over 200 years old	Third
2	Ancient	K4+300	4	-1	Left	12 trees, lindera megaphylla (Pig excrement	Third

	tree group of lindera megaphylla					nan), average DBH of0.66m，average height of 15m, average age of over 150 years old	
3	Ancient tree group of pinus massonianai	K5+800	6	-1	Left	2 trees, Chinese red pine, average DBH of0.42m, average height of 18m, average age of over 100 years old	Third
4	Ancient tree group of cypress	K6+220	5	0.5	Left & right	7 trees, cypress, Chinese red pine, China fir, average DBH of0.4m, average height of 14m, average age of over 100 years old	Third
5	Ancient tree group of phoebe zhennan	K8+300	3.5	-1	Left & right	39 trees, phoebe zhennan, cypress, lemon, average DBH of0.76m, average height of 14m, average age of over 300 years old	Second
6	Ancient phoeb	K8+410	4500		Southeast	The ancient phoebe zhennanis located at the Gaozhuang Temple Village	First

	e zhennan					of Qinggangpo Town, with the age of over 1300 years old, height of 25m, DBH of 2.8m，and is praised as “the king of phoebe zhennan of Guizhou”	

Because the ancient tree groups along the lines of the proposed road are neat the roads, and some of the trees are just at the road side, the road construction and running may influence or damage those ancient trees. As a result, the scientific, reasonable and effective protective measures must be taken to protect and avoid the ancient and rare trees so as to guarantee the normal growth of them. However, the First Grade State Protection tree, “the king of phoebe zhennan of Guizhou”, is far away from the proposed project and will not be influenced.

3. Animals

According to the data provided by Sinan Forestry Bureau, in the Siyetun Nature Reserve, there are over 100 kinds of Second Grade State Protection animals, such as syrmaticus reevesii, chrysolophus pictus, chrysolophus, lophura nycthemera, forest musk deer, pangolin, large Indian civet, small Indian civet, otter, naemorhedus goral, bharal, grass owl, bubo bubo and little egret. In the underground river of the Myriad Buddha Hole of the conservation area, a kind of white and transparent fish was found, which is called as transparent fish by the local people.

According to the on-site investigation, interview and enquiry of Sinan Forestry Bureau, Bureau of Housing and Urban, Department of Transportation, local government and relevant personnel, the proposed “Road of Shangguanqing to Langan” is a village road originally. Along that line, the activities of the villagers are frequent. And farm vehicles, motor vans and tricycles etc. always pass it. Besides, rare wild animals of Siyetun Nature Reserve are mainly in the areas around Siyetun and the Myriad Buddha Hole, which are far away from the renewal project of the road. The closest distance is about 2km. As a result, there is no rare and endangered wild animal of national protection is found along the road line. The rare animals distributed along the road line include rabbit, squirrel, snake, grass carp, crucian, loach and eel etc.; the livestock include pig, cattle, sheep, chicken, duck and goose etc.; the artificial

breeding fish include grass carp and cyprinoid etc.

As a result, the construction and running of the project has no impact on the rare and endangered animals in the nature reserve. However, once wild animals are found during the construction, the constructors cannot catch and kill them. They can only transport those animals to the place far away from the road for release. If any unit and individual find the injured, sick, hungry, trapped or lost wild animals under national and regional protection, he or she must report to the local administrative department for wild animals at once to take rescue measures; or he or she can send the animals to the nearest unit with lifesaving equipment. The rescue unit then should report to the local administrative department for wild animals.

4. Opinion of the competent department

According to "Sinan Forestry Bureau's Reply Letter to the Two Projects of the Village Roads from Shangguanqing to Langan in Yangjiaao and its Impact on the Scenic Spot and the Vegetation" of Silin Letter [2014]No.5 (November 11, 2014.See the attachment)， the works scope of the proposed project did not involve the habitat of terrestrial wild animals of national protection and the typical ecosystem of rare plants. So, it has no impact on the nature reserve and can be constructed.

4.3.1.3 Impact analysis of Egret Island Scenic Spot of Wujiang of Sinan---Longdijiang Scenic Spot

1. The relationship between the proposed project and the scenic spot

According to the on-site investigation, the Qinglongju Bridge of the proposed project lies on the river of Longdijiang Scenic Spot--- the Egret Island Scenic Spot of Wujiang, Sinan. The Qinglongju Bridge is 40m long and 7m wide with RC box girder of 1-30m. Its relationship with the main scenic spots of the region can be seen in the attached map 4.3-1. Longdijiang Scenic Spot starts from Maogaiding in the east to Taoziping in the west and from Haojiawan villages in the south to Zhoulaowan in the north. It is connected with the Haojiawan Scenic Region. It covers an area of 25km^2, including 3 spots and features, namely, Flying Dragon Cave, Small River scenery and Longdijiang scenery. The overall planning of Longdijiang scenery is: to strengthen the renovation of the riparian green engineering and the renovation of villages, to dredge the waterway and protect the water body, to activate the above-water excursion and carry out the leisure sightseeing and photography tour activities on the basis of the beautiful sceneries.

2. Impact analysis of the Longdijiang Scenic Spot

The proposed Qinglongju River lies in the Longdijiang Scenery—the Small River Scenery belt. Judging from the Figure 4.3-2, it can be seen that there is no special natural landscape and human landscape at the river reach of the bridge cross-domain and in the neighborhood. The majority is the river and the river-way landscape formed by the Chinese asters and forest along the two sides of the river. The construction of the bridge may destroy part of the artificial vegetation of cypress, sinocalamus affinis and shrub on both sides of the river. It can influence part of the river-way landscape. However, if the vegetation can be recovered in time, the impact of that area can be reduced. Because there will be no such temporary venues and facilities as slag dump, spoil ground and engineering transport routes, the facility installation of the main work and the temporary work will have little impact on the human landscape, natural landscape and the forest landscape in the scenic region. But the design of the future bridge type of the scenic region should coordinate with the natural river scenery of the river and the bank, the completed bridge will become a beautiful scenery of the river; what's more, for the development of the water tourism project of the Small River,

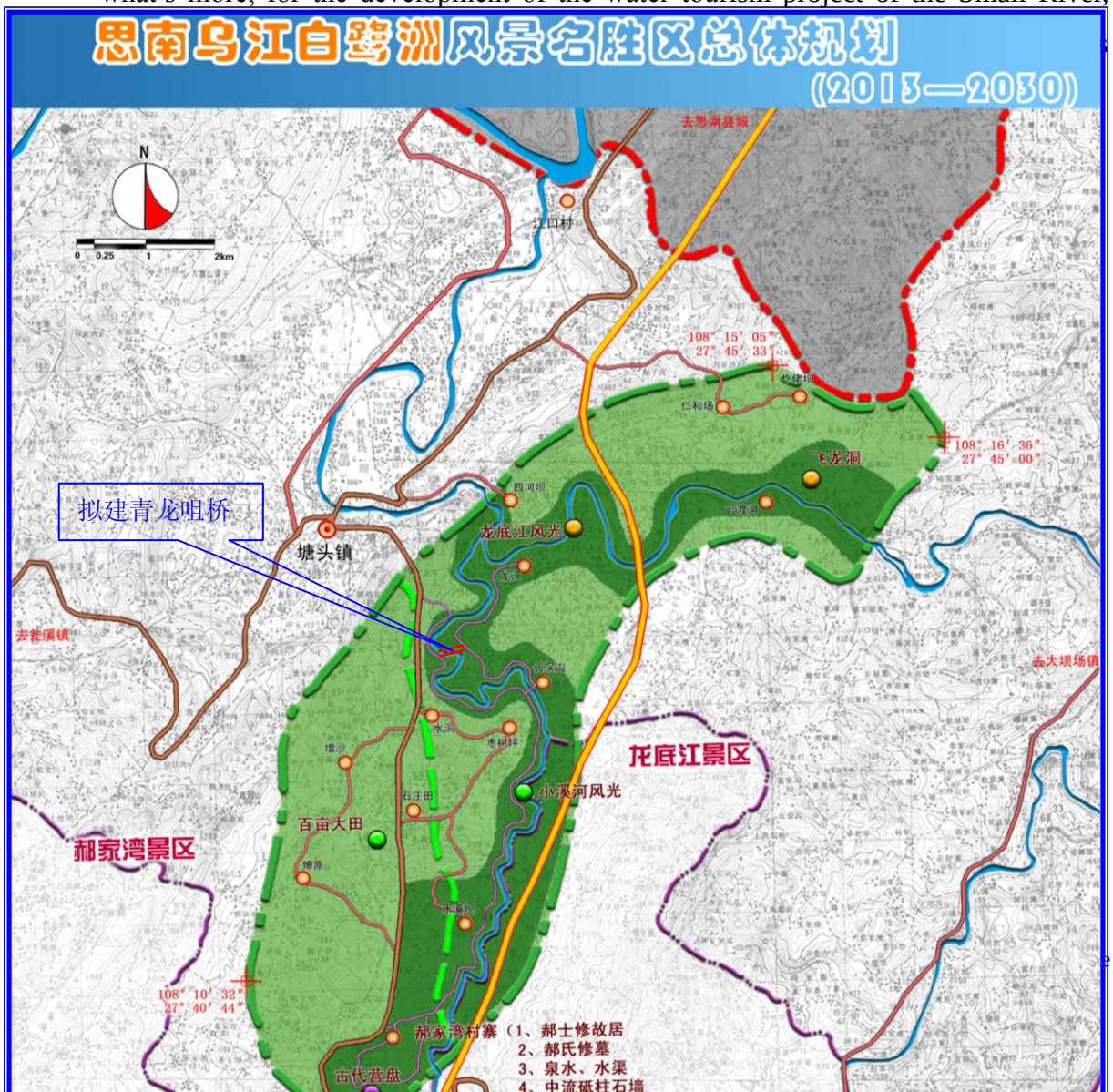


Figure 4.3-2 The relationship between the proposed Sinan Qinglongju Bridge and the main scenic spots

4．Opinion of the competent department

According to the Sinan housing and urban-rural construction bureau's letter [2014] No. 88 and 89 "the Reply Letter of Relevant Issues on the Transportation Infrastructure Construction Financed by the World Bank Loan Applied by RTA" (November 12, 2014. See the attachment.) The site selection of the proposed Qinglongju Bridge will not influence the planning, vegetation and landscape of Sinan Wujiang Egret Island Scenic Spot—Longdijiang Scenic Region and this program can be carried out.

4.3.1.4 Impact analysis of ecological environment of major project

1. The impact of bridge engineering on ecological environment

The bridges to be constructed in the project include 18 small bridges, totaling 366.6m and 12 middle bridges, totaling 470m. Altogether there are 30 bridges of 836.6m, 18 in Dejiang County and 12 in Sinan County. Except the Sinan Qinglongju Bridge which employs RC box girder of 1-30m, the others all employ hollow slabs. (See Table 2.1-2) The construction of the bridge engineering will occupy some of the cultivated land and destroy part of the cropland; the excavation and pouring of concrete of the bridge group construction may cause a certain degree of soil erosion. If the protection and management of the environment is not strengthened and the abandon slag, concrete, slurry, sludge, construction wastewater as well as the household garbage and domestic wastewater of the constructors are poured into the river, the river way will be blocked which will influence the landscape, pollute the water body and influence the aquatic organism. For this reason, during the bridge construction, the management must be reinforced and the environmental protection measures must be implemented strictly. Try best not to occupy fertile farmland and good soil. For the land temporarily occupied by the work-yard and way, the land function should be recovered as soon as possible after the construction. Soil and water conservation measures should be taken before the basic excavation. Try to avoid the construction on rainy days so as to reduce the soil erosion. Put an end to pour the abandon slag, concrete, slurry, sludge, construction wastewater as well as the household garbage and domestic wastewater of the constructors into the river so as to

reduce the influence on environment.

The rivers crossed by the bridges of the project basically are mountain streams, some of which are dry ditches and seasonal streams with small river discharge. There is no important habitat. As a result, the project will not cause the degeneration and loss of the habitat. The short-term potential impact during the construction can be avoided through effective measures. The bridge with relatively large span is the Qinglong Bridge at Sinan County (RC box girder of 1-30m), which will cross the branch of Longdijiang, Xiaoxihehe. As a result, this evaluation takes the impact analysis of the construction of Qinglongju Bridge on ecological environment as an example to illustrate the bridge construction's impact on ecological environment.

Xiaoxihehe is the branch of Longdijiang. It originates from Xiaoxihe, Longtang Town,Shiqian County and passes Longtang, Banqiao. Then it feeds into Longdijiang. It is a small river with the whole length of 15.6km, the natural head of 80m, the water-collecting area of 219km^2, the average annual discharge of .52m^3/s.52m^3/s and the theoretical standing stock of 1243kw. According the on-site investigation and data collection, there is not native vegetation on both sides of Xiaoxihehe, which is mainly covered by artificial secondary vegetation of cuptessus funebris forest, masson pine forest, bamboo forest, and shrub wood as well as cropland of paddy, rape and grapefruit. In the evaluation area of the project, there is no wild and rare plant of national protection; the stream water birds include: Chinese pond-heron and little egret etc; the species of aquatic higher plants of the evaluation area are unitary and the number is small. The majority distributes in pit-ponds or ditches of the area. Because of the high quality of the water in Xiaoxihehe and the lack of organic nutrients which cannot provide stable growing habitat for the aquatic higher plants, the species of the aquatic higher plants are unitary and the biomass is small. Only at the wet zones along part of the bank of Xiaoxihehe, the distribution of iris tectorum, cress, equisetum ramosissimum, watercress, alternanthera philoxeroides and the majority of the fish include carp, grass carp, crucian, loach, finless eel and hemiculter leucisculus etc; in this investigation, no fish spawning site of large scale and no national protective fish and migratory fish between river and sea are found. The fish in the evaluation area mainly are the settling fish. For this reason, that river does not belong to the important "natural habitat".

Because Qinglongju Bridge, 40m long and 7m wide, which is designed to employ

RC box girder of 1-30m, has no pier in the river, its impact on the environment mainly is that the project construction will occupy some of the forest land and dry land and it will destroy some of the cypress, bamboo forest, shrub and cropland at both sides; the excavation and pouring of concrete of the bridge group construction may cause a certain degree of soil erosion; the pouring of the abandon slag, concrete, slurry, sludge, construction wastewater as well as the household garbage and domestic wastewater of the constructors into the water will block the river way, influence the landscape, pollute the water body and influence the aquatic organism. For this reason, during the bridge construction, the management must be reinforced and the environmental protection measures must be implemented strictly. Try best not to occupy fertile farmland and good soil. For the land temporarily occupied by the work-yard and way, the land function should be recovered as soon as possible after the construction. Soil and water conservation measures should be taken before the basic excavation. Try to avoid the construction on rainy days so as to reduce the soil erosion. Put an end to pour the abandon slag, concrete, slurry, sludge, construction wastewater as well as the household garbage and domestic wastewater of the constructors into the river so as to reduce the influence on environment.

In conclusion, the rivers that the proposed bridges will cross do not involve important habitat. The project will not cause the degeneration and loss of habitat. The short-term potential influence can be avoided through effective measures.

2. Environmental impact analysis of the soil digging and discarding places

（1）Quantities of the soil digging and discarding places

The Feasibility Study Report of the project recommends the excavation amount of 5877800m^3, the use amount of 389400m^3, the fill amount of 1767800 m^3, the borrow amount of 38100 m^3 and the abandon amount of 4014300 m^3. The amount of excavated earth work of the road project is 5687700m^3; the use amount is 1379400m^3; the fill amount is 1767800m^3， the borrow amount is 38100m^3; the abandon amount is 4014300m^3； The amount of excavated earth work of the bridge project is 10000m^3; the use amount is 10000m^3. No fill, borrow or abandon. The detailed amount of earth work in this project can be seen in the table 2.6-4.

（2）Analysis of spoil and residual impact on environment

Exposed spoil ground surface will cause severer dust pollution if any measures unavailable；

Water loss and soil erosion will be caused if there is no temporary guarding and water-proof work made in spoil ground；

The destroyed ground vegetation will bring about adverse impact on eco-environment。

（3）Analysis of the rationality of the spoil ground

According to the Feasibility Study Report of the project, this project has not borrow area. All the earth-rock excavated for the bridge should be made full use of and cannot be abandoned. For this reason, there are only 80 borrow areas set along the village road line. They are distributed at each of the road of the project. The closest distance is 3m and the farthest distance is 300m. The storage capacity is 4583900m^3. They can accommodate 4114300 m^3 anandon. (See Table 2.6-5 and the Figure4.3-3 the selected pictures of some spoil ground). It can be inferred from the Table 2.6-4 and Table 2.6-5 that there is no spoil ground in the road of “Shangguanqing to Langan”and “Sanchatang Bridge”of the project which cross Sinan Siyetun Nature Reserve as well as the Qinglongju Bridge which crosses the Xiaoxihehe of Longdijiang Scenic Region of Sinan Bailuzhou Scenic Spot, where the cut and fill is balanced; the spoil ground selected in the project avoids such sensitive areas as the nature reserve and drinking water protected areas; the spoil ground selected for the village road is at the sides of the roads and some of the land occupied by it is wasteland and barren dry land. As a result, the evaluation holds that the selection of the spoil ground is reasonable. But in the following design, the cut and fill of the earth work should be made balanced. The amount of excavation should be made equal to the amount of fill so as to reduce the abandon amount. The selection of the spoil ground should be carried out strictly in accordance with the requirements in the following Table 4.3-5.The prevention of the soil erosion and the reduction of its impact on ecological environment can be done only through the strict selection of spoil ground, the effective measures of soil conservation, the building of solid retaining dam in the low-lying places. The waste should be rolled tightly while piled up. After that, take effective measures to reduce the impact on ecological environment, such as greening measures and second ploughing.

In conclusion, the selection of the spoil ground is basically reasonable. But the construction unit must strengthen the management and make it clear that the place is only used as spoil ground, where the polluting waste residue cannot be deposited,

such as household garbage and construction waste.

Table 4.3-5 Selection requirements for spoil ground

places that cannot be selected	Places that can be selected
•Basic farmland or other cropland, paddy field and economic crop field •House site •Forest land •Land within the range of 200m of river basin •Land within sensitive area of nature reserve, scenic spot, water conservation district and forest park • Depression or paddy field •Land with good vegetation •Danger zone of collapse and landslide • Susceptible area of debris flow •Land with special use	•Waste land •Abandoned land •Other inferior land •Col or low-lying area

Zhangting Road to Liangtian Branch（K1+330） Zhangting Road to Liangtian （K1+490）

Figure 4.3-3 The selected pictures of some spoil ground

4.3.1.4 Analysis of the impact of proposed road on the agro-ecology

The main impact of this project on the agriculture is the occupation of farmland. The proposed project will occupy the farmland of 33.87hm^2 (all are dry land), which accounts for 0.24‰ of the cultivated area of 141673hm^2 along the line. For this reason, the project has little impact on the overall agriculture along the line. However, the occupied farmland will lose the originally agricultural production capacity, which will cause a certain degree of loss of agricultural production in the areas along the road line. The crop yield will be reduced so that the agricultural income and the life of the farmers along the line will be influenced to some extent. After the completion of the project, the reclamation in the temporarily occupied land should be carried out in time. Meanwhile, land requisition compensation and resettlement policy should be implemented effectively. With the adjustment of the local industrial structure, the level of the farmers' production and life should be guaranteed not lower than the current level.

4.3.2 Ecological environment protection measures

4.3.2.1 Ecological mitigation measures in design phase

1. In the design of the next phase, in case that requirement of technical standards can be satisfied, the road wiring should conform to the rise and fall of landform as much as possible so as to make full use of landform, optimizing the vertical plane design, lowering the height of fill and reducing the amount of excavation and fill, such as semi-filling and semi-excavating. Take such measures as contraction of sub-grade slope to reduce land occupation. Reduce the occupation of fertile land and good soil (especially the basic farmland) and reduce the damage of surface vegetation.

2. The design the road greening and protection engineering should be made along with the main work.

3. During the design phase, pay attention to the selection of the spoil ground, temporary construction camps and temporary construction road with the purpose to reduce the impact on the ecological environment. During the design phase, the

selection of the spoil ground, temporary construction camps and temporary construction road should get the agreement of the relevant administrative departments. Avoid nature reserve, scenic spots, water conservation district, water point, basic farmland, forest land, scenery, cultural relic, animal habitat and land with special use so as to reduce the impact on ecological environment.

4.3.2.2 Ecological protection measures in construction period

1. Make reasonable planning, make the cut and fill of earth work balanced, make good vertical transportation, reduce temporarily occupied land and earth borrowed. Carry out greening measures after the excavation of mountain so as to avoid great impact on landscape. During the road construction, any earth or rock cannot be taken from the nature reserve and scenic spot. And it is forbidden to destroy any forest and other living resources not involved in the road project. Waste earth, waste gravel, household garbage as well as other construction waste, waste residue and waste liquid cannot be discharged in the nature reserve and scenic spot. The waste earth and stone should be piled up in the spoil ground of the nature reserve and scenic spot. They cannot be discharged in the ridge or gully in order to keep the project area clean and tidy. In the section from Hetou Quankou village Dejiang County to Dayuan Road K4+000 (Natural stone horse of cultural relics),Sinan Siyetun Nature Reserve and Wujiang Bailuzhou Scenic spot, the earth borrowing, spoil and the setting of construction camp are forbidden.

2. Strengthen the environmental protection education of constructors and enhance environmental protection awareness. Don’t fell trees disorderly during the construction. The earth borrowed and abandoned should be treated in accordance with the design requirement. Reduce the damage caused to the lawn and shrub around the work area. The construction camp cannot be set in the forest land. Transplant the vegetation in the section that the road passes. Deforestation is strictly forbidden. As to the wild and rare endangered plant and ancient tree, try best to avoid them. If avoidance is unavailable, those plants and trees can be transplanted after the agreement of relevant administrative department. As to the road trend, try best to choose the barren mountain and grass slope and avoid the areas with relatively high vegetation coverage so as to reduce the damage to the forest resources.

According to the Wildlife Protection Law of People’s Republic of China, it is forbidden for any construction unit and individual to illegally collect the wild plants or destroy its growing environment. It is forbidden to collect and fell the wild plant

and ancient trees under State Protection (Category I and II). If there is wild plant and ancient tree under State Protection (Category I and II) is found which is to be felled during the construction, make report to the competent administrative department for wild plants of the local people's government and implement reliable protection or transplantation measures. As to the famous and ancient trees along the Road of Shangguanqing to Langan in the Siyetun Nature Reserve and other roads, deforestation is forbidden. Try to take reliable measures to avoid and protect them. It should be guaranteed that these famous and ancient trees are not destroyed and hurt during the construction. And it is forbidden to use these ancient and famous trees as upholder, to mark on the trunk or to twist rope and iron wire around the trunk; it is forbidden to flood roots, to seal terrace or to keep out sunshine; it is forbidden to trim or cultivate plant arbitrarily if without the agreement of forestry administrative department of the district; it is forbidden to destroy the sign and facility protecting the ancient and famous trees.

3. According to the Wildlife Protection Law of People's Republic of China, the environmental protection education for constructors should be strengthened during the construction. The propaganda of "Protect nature and love wild life" should be enhanced; it is forbidden to use weapon, poison and explosive in hunting. The constructor cannot catch and kill the wild animals found in the construction. They must transport the wild animals to the place far away from the road for release. If any unit and individual find the injured, sick, hungry, trapped or lost wild animals under national and regional protection, he or she must report to the local administrative department for wild animals at once to take rescue measures; or he or she can send the animals to the nearest unit with lifesaving equipment. The rescue unit then should report to the local administrative department for wild animals.

4. Strengthen the publicity and education of the administrative and construction personnel. Open flames are forbidden in the nature reserve and forest land. It is forbidden to bring kindling and explosive into the protection area and forest land so as to prevent forest fires. The construction unit should strengthen the connection with the local forestry bureau during the construction. When the construction involves the section in the Siyetun Nature Reserve, the construction unit should sign a forest fire prevention liability form, an environmental health liability form and a forest and wildlife protection liability form with the Forestry Bureau of Sinan County before entering the area. And then the road construction and the management of the

protection area can be implemented orderly and they can cooperate with each other.

5. If the various wooden packing and other materials imported by the construction unit may cause exotic harmful biological invasion, the construction unit should export the quarantine of the local forest quarantine organization and import the re-inspection of the local forest quarantine organization in order to prevent the invasion of harmful outside living beings. The nursery stock and grass seed used in the road greening should be native plants. However, it is strictly forbidden to excavate wild resources for planting locally.

6. Slag wall should be built around the spoil ground. Keep the principle of retaining first and abandoning later. The retaining wall engineering should be arranged according to the different stages. Drainage ditched should be built on the top and side of the waste slag so as to avoid the direct erosion of the rain. Spread grass seeds on the exposed part of the spoil ground for greening.

7. Carry out planting in the environmental facility belt in accordance with the greening design requirements after the formation of the pavement. In 2-3 years of the road operation, the vegetation coverage rate along the road line should be recovered to the original level.

8. Strictly keep the blasting technical specification and choose proper season and time for blasting; try best to reduce the blasting in the movement area of the wild and rare life of national protection. If the blasting is unavoidable, get the agreement from the administrative department of the nature protection area so as to avoid the disturbance and destroy caused by blasting to normal life and activity of wild life

9. It is as far as possible to select barren mountain or dry land as temporary storage yard, which should be cleaned and re-greened after the project is completed so as to compensate for the loss of the green land caused by temporary occupation.

10. The construction unit should put aside the soil of plough layer of the occupied farmland, which will be used for the soil improvement of the newly cultivated land, poor land or other farm land.

11. Deal with the allocation of forest land and forest cutting in accordance with the law.

This project is supposed to fell trees after the completion of procedure of allocation of forest land and forest cutting by the owners, the construction unit, the units of forest land ownership and relevant departments organized by Dejiang Forestry Bureau

and Sinan Forestry Bureau. Keep an eye on the felling and make proper use of the trees from the project area with the purpose to reduce the forest loss.

12. It is as far as possible to avoid the occupation of cultivated land during the construction, especially the basic farm land. The occupied land should be compensated in accordance with relevant policies. Farmers' production will be restructured, making land-lost farmers' living standard not lower than the level before land requisition. After the project is completed, the rehabilitation of temporary ground and spoil ground should be made in time to reduce the occupation to cultivated land.

4.3.2.3Landscape protection scheme

（1）Protective measures of natural landscape

1. There should be clear construction site or fencing. The construction equipments and materials of all kinds should be stacked in categories;

2. Conduct cleaning and re-greening after the end of the construction of each construction site;

3. Disorder felling, excavation and stacking is strictly forbidden;

4. Deep cut is forbidden in the scenic spot. It is forbidden to destroy any scenic spot and landscape in the area. It is also forbidden to distribute the temporary construction camp and spoil ground in the place with scenic spot and to distribute the temporary construction camp and spoil ground that may influence the scenic spot. It is forbidden to carry out any behavior destroying the scenic spot.

5. Carefully design the spoil ground. On the basis of the balanced excavation and filling, select proper site for the spoil ground. Make the storage area clear for the waste slag of every section. It is forbidden to carry out excavation and abandon without planning. The transportation and storage of waste slag as well as the clearance and re-greening of the spoil ground afterwards should be involved in the construction cost. If the waste stone (slag) is to be sold to the local town or village, the agreement is needed. Besides the occupation cost, make clear such obligations as fencing, smoothing and clearing which should be shouldered by town and village. No scattered slag point can be seen within the sight of the observer on the road. Otherwise, it should be dealt with before the road opening. The rain-proof dustbin should be set to collect household garbage. The household garbage and construction garbage should be transported out of the scenic spot in time. Strictly control the transportation process in order to prevent waste leakage.

6. The road greening should coordinate with the natural landscape along the road line. In particular, in the nature reserve and the scenic, only the greening measures coordinating with the local landscape are acceptable; and the seeds of trees and grasses that are suitable for local growth and coordinate with the local vegetation are acceptable.

（2）Protection measures of scenic spot and scenery

The site of the project construction will not cause any influence to the scenic spot itself. The protection of the scenic spot mainly refers to the protection of construction site. That is the location of Sinan Qinglongju Bridge, Wujiang Bailuzhou Scenic Spot—Xiaoxihehe of Longdijiang Scenic Spot.

The protection measures mainly refer to the scientific construction measures taken to reduce the adverse effect caused to the water body of Xiaoxihehe. Strengthen the study of construction technology and the measures of greening restoration. Make sure that the construction sediment will not enter the river way. Avoid the construction in wet season and rainy season. Make full preparations for the drainage works in the construction site. Pay special attention to the disposal and discharge of the polluted water and waste water brought by the bridge construction. It is forbidden to discharge the polluted water, waste water and muddy water into the Xiaoxihehe, which will influence the scenic spot and scenery of the downstream.

（3）Measures mitigating the impact on touring activities

The mitigation of the impact on touring activities refers to the reduction of the impact on the touring in the Xiaoxihehe of Longdijiang Scenic Spot.

The emphasis is to mitigate the impact on the senses (such as vision and hearing) of the tourists in the process of construction and the impact on the touring route.

The measures mainly include safe and civil construction, optimization of the construction organization plan, organization of the touring route and mitigation of the impact on the touring activities.

4.3.2.4Measures of geological disaster prevention and control

1. Roadbed section

According to the result of the forecast evaluation, put forward measures to prevent and control the geological disasters that may happen during the construction of excavation and filling area and after the opening of the road. Basic common prevention and control measures include slope cutting & unloading, intercepting and

discharging water, retaining, anchoring, slope protection, propping and inserting, grid network blocking etc, which are all the common means used in the geologic disaster prevention and control project. During the specific construction process, according to the conditions of the site, make serious consideration of the scheme's "pertinence, suitability, integrity, operability, safe reliability, economic rationality, beauty and environmental protection". Try to solve the problems in a scientific and orderly way. As to the pavement which will pass the area with unfavorable geology, various prevention measures should be taken according to character of the potential different geological disasters.

（1）latent instable slope: Make sure that the work at the exploration is carried out properly. Classify the rock and soil types as well as structural features. Evaluate the stability of the slope and set reliable shoring engineering and rational construction sequence according the evaluation result. Take measures to avoid the latent instable slope with complex nature and great threat.

（2）Collapse and landslide: Find out the form, range, cause and degree of stability. During the construction process, take the following measures for prevention and control so as to stabilize them, such as cutting the slope and setting the retaining wall. Avoid the areas with large-scale landslide and the areas seriously influenced by collapse.

（3）Hidden karst and subsidence: Find out the burial depth, distribution, extension and pumping & drainage conditions. Such measures as blasting & filling, and bridge crossing can be taken. Try to avoid the areas greatly influenced by hidden karst.

（4）Excavation slope section: Find out the slope structure, rock-soil features, excavation height and possible disasters. During the construction, take different proper slope ratio, slope type and means according to different specific conditions. In the process, pay attention to the construction sequence and implement the information construction. Set monitoring and early warning system for the hazardous slope. If any danger is found, deal with it in time. It is forbidden to take destructive excavation means, such as chamber blasting. In case of construction difficulty in the dangerous slope, make translocation and avoid that slope or use tunnel to pass it.

（5）Fill low section: Find out the soil thickness, underground water conditions, fill depth and possible disasters. Select proper padding, tamp in layers and compact by grades. In the place with soft soil, first clear the soft soil layer, change the soil and fill

rock. After that, fill the earth. In the place with soft soil which is difficult to be dealt with, use bridge to cross it.

（6）During the construction, pay attention to the reasonable storage of waste slag so as to avoid the threat of slag slide and debris flow formed by the waste slag, which will influence the construction safety.

2. Bridge

The possibility of the geological disasters caused by the bridge construction generated by the flat field on both sides of the bridge abutment and the excavation of the pier foundation are the same with those in the excavation section. For this reason, the prevention and control measures are the same with those taken to deal with the geological disasters in the excavation section. As to the bridge which will cross the ditch station and valley, the broken collapse rock and the loose dangerous rock mass generated by the construction should be cleared. As to the waste slag, they should be stocked in a new place or be blocked by retaining dam in order to prevent them from slumping and evolving to debris flow which will influence the bridge safety.

3. Spoil ground

The spoil ground is a broadening gulch, with a certain slope and catchment. The generated geological disasters mainly include landslide and debris flow of the fill side slope. The prevention and control measures are the same as those in the fill section. Besides, there are other kinds of measures should be taken, such as temporary protection of slope and temporary drainage. And some spoil ground is located under the karst pipeline. The Karst collapse may be generated during the use. After the reason is found out, take corresponding measures to deal with that.

In addition to the main spoil ground and fill materials, retaining facilities should be set in accordance with the local conditions if the spoil is to be abandoned along the road line. In this way, the environmental damage or other disasters caused by the new disaster-inducing body formed by the water and soil loss which is triggered by the influence of the surface water can be avoided.

4. Adjacent villages

The geological disasters that the villages near the road line suffer from mainly include the collapse and landslide caused by the excavation of the project construction as well as the slump of the fill slope. The prevention and control measures are the same as the measures taken in the geological disasters of excavation and fill section.

As to the houses on the excavation slope, the main prevention measure is anti-skating and consolidation. As to the houses at the foot of the excavation slope and fill slope, the main measures are cutting and unloading, protection and prevention. As to the slope which is difficult to be dealt with, house relocation and avoidance is recommended.

For this reason, before the construction, the construction unit should carry out the geotechnical engineering investigation of the site in accordance with the basic procedure and requirement of the project construction so as to find out the rock-soil engineering geological condition and the growth characteristics of the karst, provide reliable geological basis for the project construction and guarantee the safety of the project construction. According to the characteristics of the geological disasters of the project, take scientific, effective and safe measures to prevent and control the geological disasters so as to guarantee the safe construction and safe operation of the project.

4.3.2.5 Control measures of ecological damage during the operation

Such measures as increase of new plants and land reclamation will be taken along the line of the proposed road. These measures will not only make compensation to some extent for the plants which are influenced by the road construction, but also reduce the water and soil loss, make the air clean, lower the noise and beautify the environment etc.

1. In accordance with the design requirements, finish the work of planting trees and grass in the lands which can be greened within the range of the proposed road slope, scenic spot section and land acquisition of road, with the purpose to recover vegetation, reduce water and soil loss, reduce the pollution of the water of the road side caused by the running water on the road surface in rainy season.

2. Do a good job in the vegetation recovery and greening maintenance in the temporarily occupied land, such as construction camp, spoil ground and construction road.

3. Measures of ecological restoration: The proposed project is planned to occupy the shrub land with an area of 3.94hm^2. The construction unit will take measures to plant grass and tree to restore the ecology in the area of the road construction with the purpose to green the slash caused by the road construction as soon as possible. The road greening engineering is a systematic one. The recovery of vegetation and reclamation should be carried out when the main work is completed preliminarily and

such engineering as slope is completed basically.

4. For the famous and ancient trees involved in the road construction, transplantation may cause the death of the plants because the trees are old. For this reason, take measures to avoid them to guarantee the safe growth of the ancient trees. And after the construction, those trees will become the beautiful scenery on the road side.

5. Strengthen the study, publicity and education of Wildlife protection law of the People's Republic of China, Wildlife protection law of the People's Republic of China and the relevant rules.

It is forbidden for any construction unit and individual to illegally collect the wild plants or destroy its growing environment; it is forbidden to collect and fell the wild and rare endangered plant and ancient tree under state protection.

The propaganda of “Protect nature and love wild life” should be enhanced; it is forbidden to use weapon, poison and explosive in hunting. The constructor cannot catch and kill the wild animals found in the construction. They must transport the wild animals to the place far away from the road for release.

4.4 Water Environmental Impact Assessment and Protection Measures

4.4.1 Assessment of Water Environmental Impact

4.1.1.1 Impact of Construction on Water Environment

1. Impact of bridge construction on water environment

In the road project, the one with relatively great impact on water environment is the bridge construction where construction workers are concentrated. The bridge project includes 18 small bridges 366.6 m in total length and 12 medium bridges 366.6 m in total length, which total 30 bridges with a total length of 836.6 m. 18 bridges will be built in Dejiang, and 12 bridges will be built in Sinan. The bridges mainly span over some tributary ditches, gullies, etc., as detailed in Table 2.1-2 in Chapter 2 of this report.

Water agitation by bridge foundation construction, construction machinery oily water, construction workers' living wastewater, runoff scour of construction materials piled near the waters due to careless management or their entry into the waters due to winds and other relevant construction activities will have some impact on waters.

During the bridge construction, there are mainly the following construction

aspects which can cause water pollution:

(1) If machinery oil leakage during bridge construction and residual oil during machinery maintenance are discharged directly into waters, they will cause some oil pollution to water quality.

(2) If the materials and oils needed in the bridge construction which are stacked on both river banks are poorly managed and not covered tightly, they will be washed into the waters by rainfall during the rainy season or storm period. If the place where materials are stacked is below the water level of the wet period, they may be flooded by river water during the storm season, which consequently enter the waters and pollute the waters.

(3) If bridge construction waste and other solid wastes are stacked dispersedly without centralized collection, they may enter the waters and cause pollution.

(4) During construction period, living wastes are from construction workers' living, which contain large amounts of organic matters and pathogens. If they are discarded into the environment, and washed into the waters by rainfall, they will also contaminate the river water quality and lead to the spread of diseases, thereby threatening the health of downstream people. Therefore, living wastes should be collected at a specialized yard, in order to reduce environmental pollution.

(5) Construction camp living sewage is mainly wastewater from construction workers' eating and washing as well as fecal sewage, which contains animal and vegetable fats, food residues, detergents and other organic matters. Closed septic tank toilets should be built for sewage treatment. If construction workers' living sewage and wastes are not managed well during the construction period, they will be discharged into the river and pollute the water. According to the survey, main pollutants in untreated sewage include COD, ammonia nitrogen, SS, petroleum and animal and vegetable fats. Concentrations of various pollutants are shown in Table 4.4-1.

4.4-1 Composition of untreated sewage in construction camp

Type of pollutant	**pH**	**BOD_5 (mg/L)**	**COD_{Cr} (mg/L)**	**Ammonia nitrogen (mg/L)**	**SS (mg/L)**	**Petroleum (mg/L)**	**Animal and vegetable**

							fats (mg/L)
Concentration	6.5～9.0	400～600	800～1200	40～140	500～600	2～10	15～40

Quantity of sewage discharge in construction camp is calculated according to the following equation:

$$Q_S = (K \cdot q_1 \cdot V_1)/1000$$

Where Q_S——Quantity of sewage discharge in construction camp, t/d;

q_1——Daily per capita quota of water consumption, L/(people·d);

V_1——Number of people in construction area;

K ——Sewage discharge coefficient in construction area, generally 0.6~0.9, and 0.8 in this report.

Number of on-site bridge construction workers is related to the size and type of bridge, construction machinery and construction season. On-site construction workers are about 100 people/d for small and medium bridges. Hence, living sewage generated in the bridge construction camp is approximately $8m^3$ per day, and total quantity of living sewage is about $2400m^3/a$.

It can be seen from the above analysis that the relative and absolute contents of various pollutants in the living sewage from construction camp are all rather small. Taking into account the self-purification function of waters, the sewage will not cause a severe impact on rivers. But the waters along the proposed roads and bridges are mostly class II waters, which are highly sensitive. So if the living sewage in construction camp is discharged without proper management, it will cause some impact on waters along the proposed roads and bridges.

2. Analysis of impact of road construction on water environment

Road construction is a linear pollution impact, which is characterized by small quantity, dispersed discharge of sewage. Pollutants are mainly from pollution discharge at construction workers' camps, and the types of pollutants are similar to those for bridges. According to the project characteristics, construction camps should be set up near the towns or villages as far as possible, so that total amount of regional pollutants does not increase much. Therefore, the living sewage from road construction workers under this project does not impact water environment

markedly. But for construction of road sections near rivers, earth-rock excavation will lead to water-soil loss, which will tend to increase the sediment content of rivers, thereby affecting the water quality. If construction wastes are dumped without proper management, they will washed by rainfall during rainy season into rivers along the surface runoff, thereby causing water pollution. So management should be strengthened; rainwater should be drained away from the rainwater collection system, whereas living sewage should be recycled after treatment in septic tank, so as to minimize the impact of project construction on the environment.

4.4.1.2 Impact of Road Operation on Water Environment

Since this project does not involve establishment of parking or charging stations, major impact during road operation is the impact of road rainwater runoff on waters along the route. There are numerous factors which can impact the road runoff pollution, such as rainfall time, precipitation, traffic flow, level of air pollution, interval between two rainfalls and length of assimilative section. Various factors are highly stochastic and contingent. Generally, road runoff has an impact on waters along the route in the initial period after construction or when interval between two rainfalls is long. Such impact is mainly manifested as drainage of road runoff carrying suspended particles from bankside into waters near the road through drainage trench on both sides of road.

1. Road runoff formed by initial rainwater: analogy analysis finds that the major rainfall factor impacting the rivers near the roads is the road runoff formed within 1 h in the initial stage of rainfall, where main pollutants are SS, COD and petroleum. As the project has high requirement on water quality along the route, and the rivers the roads span over are class II and III waters, establishment of sewage interception trench is recommended on both sides of 30 bridges that span over waters to draw the initial rainwater away from the bridge deck. Meanwhile, establishment of impounding reservoir is also needed for collection of drained sewage. After precipitation and degreasing treatments, the sewage is recycled for road greening, etc.

Rainwater is discharged into ditches along the route through drainage trenches on both sides of roads. For sections with groundwater activity, methods like blind drain absorption and collection are proposed for interception of groundwater, so as to

ensure the stability of roadbed.

2. In order to prevent water pollution caused by car falls into rivers along the route, design of bridge parapets along the roads should be enhanced to improve their protection standards. 60 emergency lagoons should be set up on both sides of each proposed bridge, so that they can store the leaked dangerous goods in case of accident of vehicles transporting dangerous goods at the bridge site. In the event of a dangerous accident, wastewater in the emergency lagoons must be transported to sewage treatment plants having corresponding disposal capacities. Use and discharge in any form is strictly prohibited.

4.4.2 Water Environmental Protection Measures

4.4.2.1 Measures for Mitigation of Water Environmental Impact during Design Phase

The proposed roads are rural highways and do not have service area, so living sewage is generated primarily during the construction period. The wastewater generated during the construction period should be treated in standardized closed septic tanks.

Decentralized drainage should be adopted for pavement drainage, where surface water is discharged into side drains through road shoulder or discharged dispersedly from the roadbed slope. Design of bridge deck rainwater drainage should be taken into account, where deck rainwater is collected through rain pipe under the lane, and then through grit chamber at the bridgehead to finally enter the side drains. For other road surface drainage schemes, please refer to the Feasibility Study Report.

Field investigation in accordance with the People's Government of Guizhou Province Letter No. (2006) 117 *Reply of Provincial People's Government on Water Function Zoning in Guizhou*, Guizhou Provincial Water Resources Department and Guizhou Provincial Environmental Protection Bureau's *Water Function Zoning in Guizhou* Province (2006) and Tongren Regional Administrative Office Document No. (1994) 93 *Provisions on Water Environmental Function Zoning in Tongren Regional Waters* finds that the rivers the proposed roads and bridges span over are basically some rivulets and tributaries, whose water functions are class II and III waters based on the *Environmental Quality Standards for Surface Water* (GB3838-2002). Therefore,

drain outlet should not be designed in river segments of class II waters, and wastewater in roadbed drainage trenches of theses road sections cannot be discharged directly, in order to avoid pollution of waters. Establishment of sediment filtering basin is recommended in these sections, so that surface wastewater can be discharged into the nearby agricultural irrigation ditches after treatment. During the highway route selection, drinking water source protection areas and water points should be avoided as far as possible, in order not to cause new water pollution.

4.4.2.2 Measures for Control of Water Pollution during Construction Phase

1. This project needs building of 30 new bridges, 18 in Dejiang County and 12 in Sinan County, which will span over part of rivers. Design of bridge span should take full account of the requirements on river width as specified in the water resources planning.

2. The proposed road project should only make use of the dry season for bridge construction, and cofferdam technology should be employed during the bridge foundation construction. Construction wastes, rock magmas and silts should be treated and discarded in strict accordance with relevant Ministry of Transport specifications. Discharge of wastes into rivers is prohibited, which should be discarded in nearby waste disposal areas, so as to minimize the impact of bridge construction on waters.

3. Dumping of spoils into river courses during road construction and bridge building is strictly prohibited. Drilling pile muddy water should be handled in accordance with relevant local regulations, which should not be dumped arbitrarily. Temporary sediment basin should be set up for treatment of muddy water. After sedimentation, supernatant can be discharged, while sludge should be transported outward for treatment.

4. Construction camp should be set up away from the waters, construction workers' washing wastewater and living sewage should be treated by setting up closed septic tanks. The treated wastewater can be used for agricultural fertilization, which should not be discharged directly, so as to avoid deterioration of water quality in nearby rivers.

5. Construction agencies should rent nearby farm houses as construction camps as far as possible, and use closed septic tanks and dry latrines, feces produced should

be used as agricultural fertilizer after disinfection. Intercepting drains should be established around the construction camps for interception of living wastewater, meanwhile, appropriate number of sediment basins should also be set up, so that various sewages can be collected in a centralized way, treated by sedimentation, and discharged into agricultural irrigation ditches, thereby minimizing their impact on water quality.

6. Road construction should give sufficient consideration to the functions of farm irrigation and drainage facilities. If reconstruction of existing facilities is needed in some road sections, their functions should be further improved, so as not to affect the irrigation and drainage capacities in surrounding areas.

4.4.2.3 Measures for Mitigation of Water Environmental Impact during Operation Phase

1. Guardrails, catch drains, impounding reservoirs, etc. shall be provided for each bridge for effective collection and disposal of leaked hazardous chemicals.

2. Provisions on transportation of dangerous goods should be strictly implemented. Vehicles transporting dangerous goods must be clearly marked during transportation, in order to cause the attention of other vehicles. In the event of an accident, such should be promptly and timely reported to the police, and notified to relevant highway administration, fire protection and environmental protection departments timely for taking emergency measures.

3. Safety awareness and professional ethics education should be strengthened for drivers, in order to reduce traffic accidents. In the event of a leakage accident, effective pollution control measures should be taken timely to prevent chemicals from entering into the waters, so as to avoid water pollution.

4. Since there are no facilities such as service area or maintenance area during operation phase of the roads, the water environment will be basically unaffected. Rainwater drain outlets should be set up on road surfaces, or rainwater should be collected in the existing rainwater collection system.

4.5 Ambient Air Impact Analysis and Environmental Protection Measures

4.5.1 Ambient Air Impact Analysis

4.5.1.1 Construction Phase

1. Sources of pollution

This project uses asphalt and cement concrete pavements, so asphalt fume is a major source of air pollution during road construction phase in addition to raise dust. Raise dust and powdery dust are primarily from mixing of lime soils, as well as reentrainment of dust spilled and generated during material transport. Asphalt and benzopyrene are produced during paving.

2. Impact analysis

(1) Dust from vehicle traffic

According to the relevant literature, during construction process, dust generated by vehicle traffic accounts for over 60% of total dust. In completely dry conditions, dust generated by vehicle traffic can be calculated according to the following empirical formula:

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

Where *Q*——Dust from vehicle traffic, kg/km·vehicle;

V——Vehicle velocity, km/hr;

W——Vehicle load capacity, t;

P——Amount of dust on road surface, kg/m^2.

Table 4.5-1 shows the amount of dust when a 10t truck is passing through different road surfaces with different degrees of cleanliness at different travel speeds. As can be seen, under the same surface cleanliness degree conditions, the faster the vehicle, the greater the amount of dust; while at the same vehicle speed, the dirtier the road surface, the greater the amount of dust. Therefore, limiting vehicle travel speed and keeping road surface clean are the most effective means of reducing dust from vehicle traffic.

Table 4.5-1 Dust from vehicles under different vehicle velocities and surface cleanliness degrees Unit: kg/vehicle·km

Dust amount / Vehicle velocity	0.01 (kg/m^2)	0.02 (kg/m^2)	0.03 (kg/m^2)	0.04 (kg/m^2)	0.06 (kg/m^2)	0.1 (kg/m^2)
5(km/h)	0.0091	0.0153	0.0207	0.0257	0.0348	0.0511
10(km/h)	0.0182	0.0305	0.0414	0.0514	0.0696	0.1021
15(km/h)	0.0272	0.0458	0.0621	0.0770	0.1044	0.1532

25(km/h)	0.0454	0.0763	0.1035	0.1284	0.1740	0.2553
30(km/h)	0.0545	0.0916	0.1242	0.1541	0.2088	0.3063
40(km/h)	0.0726	0.1221	0.1656	0.2054	0.2785	0.4084

If the road surfaces are sprinkled frequently (4~5 times daily) during the construction phase to reduce the amount of dust in the air by about 70%, good dust fall effect can be achieved. Sprinkle test data are shown in Table 4.5-2. When the watering frequency is 4~5 times/day in the construction site, distance of dust pollution caused by raise dust can be reduced within the range of 20~50m, and the amount of dust can be reduced by 30%~80%.

Table 4.5-2 Results of sprinkler dust fall test during construction phase

Distance from roadside (m)		**5**	**20**	**50**	**100**
TSP concentration (mg/m^3)	No sprinkling	10.14	2.81	1.15	0.86
	Sprinkling	2.01	1.4	0.68	0.60
	Dust reduction by sprinkling as compared with no sprinkling (%)	80.2	50.2	40.9	30.2

(2) Storage yard dust

Another major source of dust during the road construction phase is the wind dust in open storage yards and bare grounds. Due to construction needs, construction materials need air storage; moreover, topsoil in part of construction sites needs manual excavation and temporary stacking. So dust will be produced in a windy, dry climate. The amount of dust can be calculated according to the empirical formula of storage yard dusting:

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

Where Q—— Dusting amount, kg/t·year;

V_{50}——Wind speed 50 m from the ground, m/s;

V_0——Dusting wind speed, m/s;

W——Moisture content of dust particles, %.

Dusting wind speed is related to particle size and moisture content, and therefore, reduction of air storage, maintenance of a certain moisture content and reduction bare ground are effective means of reducing wind dusting. Dispersion and dilution of dust

in the air diffusion are related to meteorological conditions such as wind speed, which are also associated with the settling velocity of dust itself. Settling velocities of dusts of different particle sizes are shown in Table 4.5-3. As can be seen from the table, the settling velocity of dust increases rapidly with increasing particle size. When the particle diameter is 250 μm, settling velocity is 1.005 m/s. It can thus be considered that when particle size is larger than 250 μm, main impact area is within the close range in the downwind direction of dust source, while those which have a real impact on the external environment are some tiny dust particles.

Table 4.5-3 Settling velocities of dust particles of different sizes

Dust particle size (μm)	**10**	**20**	**30**	**40**	**50**	**60**	**70**
Settling velocity (m/s)	0.003	0.012	0.027	0.048	0.075	0.108	0.147
Dust particle size (μm)	80	90	100	150	200	250	350
Settling velocity (m/s)	0.158	0.170	0.182	0.239	0.804	1.005	1.829
Dust particle size (μm)	450	550	650	750	850	950	1050
Settling velocity (m/s)	2.211	2.614	3.016	3.418	3.820	4.222	4.624

(3) Dust from material mixing

Analogy analysis based on the dust monitoring data of road construction lime soil mixing site finds that the downwind hour TSP concentration is 8.100 mg/m^3 at a place 5 m from the lime soil mixing station of storage ground, and 1.65mg/m^3 at a place 100 m apart; and at a place 150 m apart, the impact can already be ignored. Therefore, in this project, relatively centralized lime soil mixing station should be set up as far as possible, which should be at least 200 m apart from the environmentally sensitive sites (especially nature reserves and scenic spots), in order to avoid direct impact of dust on environmentally sensitive sites.

(4) Impact of asphalt fume on environment

Asphalts needed in the project are all outsourced. The project does not provide any asphalt mixing station along the route, so there will be no asphalt fumes from asphalt heating. Asphalt fume emissions are generated primarily during paving. According to relevant data, the impact distance of smoke pollutants emitted during asphalt pouring and paving is generally within 50 m. Therefore, when the road construction is near villages or schools, the period during which wind is directed towards villages and schools should be avoided in asphalt pouring, in order not to affect human health.

4.5.1.2 Operation Phase

1. Analysis of impact of vehicle exhaust pollutants on ambient air

Ambient air sensitive sites of the project include villages and schools along the route, and the remaining road sections are general sections. According to the estimated traffic volume of various road sections, sensitive sites are divided into three grades.

Based on current experience and measured data, analogy is made with the estimation results of other roads under the same climatic and geomorphic conditions with similar traffic flow, which finds that NO_2 and TSP do not exceed standards within a 200 m range along the route when daily traffic is 30,000 vehicles. Weighted traffic volume of proposed roads is 203-448 passenger cars/day during initial operation period, 257-581 passenger cars/day during mid-term, and 302-698 passenger cars/day during long-term. It is thus apparent that the traffic volume of this project is far smaller than the analogy projects. Besides, ambient air along the route is in a good status, and environmental capacity is quite large, so no significant impact will be caused on ambient air.

In addition, after the completion and operation of proposed roads, traffic environment along the route will be greatly improved, which is more conducive to reducing vehicle exhaust emissions. Therefore, after completion of road construction, ambient air pollution in the region will even be alleviated to some extent.

2. Analysis of impact of facilities along the route on ambient air

No ancillary facilities such as service area, project management center, maintenance work area and charging station will be established along the route in this

project, so there will be no impact of oil fumes from catering facilities on environment.

3. Analysis of impact of total suspended particulates (TSP) during operation phase

This project adopts asphalt and cement concrete pavements, which have high cleanliness. Possible sources of road dust are spills during transport process of building material or waste transport vehicles and muds on wheels and bodies of transport vehicles. In the dry, windy conditions, dust will be entrained, thereby polluting the environmental protection targets on both sides of roads. In order to control and reduce road dust, effective measures should be taken to strictly control the entry of vehicles with mud or loaded with easy spill articles without covering protection into the proposed roads; besides, regular road sprinkling can also effectively control the road dust.

4.5.2 Ambient Air Pollution Protection Measures

4.5.2.1 Measures for Mitigation of Ambient Air Pollution during Design Phase

During the highway route selection, air environmentally sensitive targets should be avoided as far as possible. Since this project does not provide any asphalt or concrete mixing station, temporary construction camps must be kept away from nature reserves, villager concentrated areas, schools, hospitals, scenic spots, drinking water source protection areas, water points, woodlands and other environmentally sensitive areas at the design stage, and construction workers should try to rent farm houses along the route, in order to reduce the impact of construction camp establishment on air environment.

4.5.2.2 Measures for Mitigation of Ambient Air Pollution during Construction Phase

1. Storage yards, lime soil mixing stations and material transport vehicle routes should be set up in open areas 200 m away from the centralized residential areas, schools and other sensitive sites.

2. Construction sites (including the sections under construction, lime soil mixing stations and major transport roads) should be timely sprinkled at a frequency of 4 times/d on sunny days and 2 times/d on cloudy days to prevent larger dust

entrainment. The sprinkling frequency can be adjusted by the supervising engineers according to the actual situation.

3. Powdery materials such as cement and lime should be canned or bagged for transportation. Materials should be stacked with covers so as to avoid spills.

4. Cooking and heating in the construction camps should use clean energies such as liquefied gas and electricity, so as to reduce atmospheric pollution by coal combustion.

4.5.2.3 Measures for Mitigation of Ambient Air Pollution during Operation Phase

1. Measures for control of atmospheric pollutant dispersion

Trees and grasses should be planted as much as possible on both sides of roads, especially in the vicinity of sensitive sites. This way, not only the pollutants in vehicle exhausts can be purified and absorbed, environment can also be beautified and landscape along the highways can be improved as well.

2. Design of travel speed and reduction of exhaust pollution should be ensured. Increase of vehicle speed can reduce vehicle exhaust emissions.

3. Measures for control of pollution sources

Control measures for exhaust emissions from vehicles travelling on roads proposed in this project should be integrated with local and national policies and measures on vehicle emissions control. Project undertakers and management agencies of this project should implement various policies and measures on vehicle emissions control formulated by national and local governmental departments, and take some corresponding measures to control exhaust emissions from vehicles travelling on roads proposed in this project. Specifically, this report recommends the following measures:

(1) Prohibit the passage of vehicles with excessive emissions of exhaust pollutants: Road section management departments can prohibit passage of vehicles with excessive emissions, which can mitigate possible environmental air pollution generated by this project to some extent.

(2) Strengthen the inspection and maintenance of vehicles: Practice indicates that the quantity of vehicle exhaust pollutant emissions is highly related to whether the

engine is in a normal state. Frequent excessive emission is mainly due to low maintenance, engine technology deterioration, etc. After using unleaded gasoline or installing exhaust purifiers, inspection and maintenance will seem even more important. Therefore, inspection and maintenance of in-use vehicles must be strengthened to maintain them in a good state, so as to reduce the emissions of exhaust pollutants.

(3) Reduce the surface dust: As road dust are from the dust particles settled on the road surface, reduction of the number of these dust particles means reduction of pollution sources.

4.6 Acoustic Environmental Impact Assessment and Prevention Measures

4.6.1 Acoustic Environmental Impact Forecast and Assessment

4.6.1.1 Assessment of Acoustic Environmental Impact during Construction Phase

1. Noise pollution sources during construction phase and their characteristics

During the construction of proposed project, a variety of large- and medium-sized mechanized equipment will be used for mechanized operations. Features of construction machinery noise are high noise level and randomness, which often have a greater impact on villages, schools and other acoustic environmentally sensitive areas near the construction sites. Therefore, mechanical noise generated by highway construction must be taken very seriously.

Acoustic environmental impact during construction phase is forecasted mainly by analogy analysis of relevant data. Machineries commonly used in road construction include transport vehicles, road builders and mixers, whose running noises are between 80dB-93dB. Different from general building construction, the noise from road construction has the following characteristics:

(1) There are a wide variety of construction machineries. Different construction machineries are used in different construction stages, and the machineries used in the same construction stage also differ, which endows road construction noise with contingent features.

(2) Noise source characteristics differ for different devices. Some devices have vibrating, abrupt and pulsing noises, which have a greater impact on people. And some devices have persistent lower frequencies, which can make people uneasy.

Construction machineries all have larger noises, but the sound level difference among them is still large. Some equipment has a running noise of up to 90dB (A).

(3) Different from general noise sources, construction noise sources consist of both stationary and mobile noise sources. Construction machineries are often exposed outdoors, which will be moved within a certain small range in a certain period of time, so noise impact scope is increased during this period as compared to stationary sources, but only on a local scale.

(4) Ratio of construction equipment to their impact scope is relatively small, therefore, construction equipment noise can be basically considered as point acoustic sources.

(5) For roads and bridges of specific sections, construction noise pollution occurs only within a period of time.

2. Methods and mode of predicting construction noise

In view of the complex, regional and periodic characteristics of construction noise, noise impact scopes of different construction equipment in different construction stages are calculated in accordance with the national "Noise Limits for Construction Site" (GB12523-90), and number of residential spots that may be affected by construction noise is estimated, so that the construction agencies can take appropriate noise pollution control measures during construction based on the actual situation.

Noise sources during construction phase are predicted by the mode of point acoustic source. In this assessment, prediction is done by employing relevant mode in the *Specifications for Environmental Impact Assessment of Highway Projects (Draft)*. The mode is as follows:

$$L_p = L_{p0} - 20\lg\left(\frac{r}{r_0}\right) - \Delta L$$

Where

L_p——Sound level at measurement point (can be octave band sound pressure level or A-weighted sound level);

L_{p0}——Sound level at reference position r_0 (can be octave band sound pressure level or A-weighted sound level);

r——Distance between prediction point and point acoustic source, m;

r_0——Distance between reference sound level position and point acoustic source, m;

ΔL——Various attenuation amounts, including those caused by air absorption, sound barriers or screens and ground effects.

For the impact of multiple construction machineries on a prediction point, the sound levels should be superimposed. Total equivalent sound level is then

$$Leq(T) = 10\lg\left[\frac{1}{T}\sum_{i=1}^{n} t_i \cdot 10^{0.1L_{pi}}\right]$$

Where

t_i——Noise action time of i-th sound source at prediction point (within time T);

L_{pi}——A-weighted sound level generated by i-th sound source at prediction point;

T——Computing time for equivalent sound level.

On the construction site boundary, the locations nearest to environmentally sensitive areas are selected as the assessment points to assess the degree by which these assessment points are impacted by daytime ambient noise based on the "Noise Limits for Construction Site" (GB12523-90) standards.

3. Impact scope and analysis of construction noise

Construction noises of various equipment are calculated according to the aforementioned prediction mode and methods to obtain their noise levels under different distances as shown in Table 4.6-1. Impact scopes of various devices are shown in Table 4.6-2.

Table 4.6-1 Noise levels of main construction machineries and vehicles unit: dB (A)

Device name	Measuring distance (m)	Sound level dB (A)	Remarks
Excavator	5	84	Hydraulic type
Loader	5	90	Wheel type
Vibratory roller	5	86	

Bulldozer	5	86	
Grader	5	90	
Paver	5	87	
Mixer	5	87	
Stirrer	5	91	
Scraper	5	93	
Roller	5	86	
Vibrator	15	81	
Dumper	5	82	
Truck	7.5	89	The larger the load capacity, the louder the noise
Mobile crane	7.5	89	

Table 4.6-2 Noise levels of mainly construction machineries at different distances unit: dB (A)

Machinery name	5m	10m	20m	40m	60m	80m	100m	150m	200m	300m
Loader	90	84	78	72	68.5	66	64	60.5	58	54.5
Vibratory roller	86	80	74	68	64.5	62	60	56.5	54	50.5
Bulldozer	86	80	74	68	64.5	62	60	56.5	54	50.5
Grader	90	84	78	72	68.5	66	64	60.5	58	54.5
Excavator	84	78	72	66	62.5	60	58	54.5	52	48.5
Paver	87	81	75	69	65.5	63	61	57.5	55	51.5
Mixer	87	81	75	69	65.5	63	61	57.5	55	51.5

As can be seen from Tables 4.6-1 and 4.6-2, roadbed construction can basically meet the "Noise Limits for Construction Site" (GB12523-90) standards at places 40 m away from the construction site during the daytime; and at places 200 m away from the construction site during the nighttime. Impact reaches relatively far during bridge piling construction, where the standards can only be met at places 126 m away in

daytime.

(1) Impact scope of road construction noise differs greatly among different construction machineries. Standards on construction site noise limits vary during the daytime, and at nighttime, the impact scope of construction noise is much louder than the daytime. In the actual construction, multiple construction machineries may run together simultaneously, at this time, the impact scope of construction noise is greater than the predicted value.

(2) Construction noise will have some impact on acoustic environmental quality along the route; such impact is mainly present within a range of 130 m around the construction site in the daytime; and within a range of 480 m around the construction site at nighttime. Roadbed construction can basically meet the limits at places 40 m away from the construction site during the daytime; and at places 200 m away from the construction site during the nighttime. Impact reaches relatively far during bridge piling construction, where the standards can only be met at places 126 m away in daytime.

To this end, the following assessment requirements are proposed based on the actual situation of project and local environments: ① Low-noise devices should be used during construction as far as possible. Selected devices must comply with the relevant national standards. Highly vibrating fixed mechanical equipment should be installed with vibration damping base, and fixed strong noise sources should be installed with noise enclosures. Meanwhile, care and maintenance of equipment should be enhanced, in order to reduce the noise levels of construction machineries from the source. ② Operation time of high-noise machineries should be negotiated with schools, so as to avoid construction during school exam time and class time as far as possible. ③ Simultaneous operation of high noise devices should be avoided. ④ Teaching and office buildings should be surveyed by sample monitoring to take corresponding noise prevention measures such as mobile or temporary noise barriers according to the monitoring results. ⑤ Project undertakers should instruct the construction agencies to post notice and complaint telephone at the construction site. Upon receipt of a call, project undertakers should timely contact local environmental protection departments, so as to promptly handle various environmental disputes. ⑥

High-noise construction equipment should not be operated at night (22:00-06:00), daytime (12:00-14:00), as well as during school exam time. If continuous operation is necessary, construction agencies should timely contact local environmental protection departments to apply for nighttime construction permits in accordance with the regulations, while announcing such and striving for the support of schools as far as possible.

4.6.1.2 Assessment of Acoustic Environmental Impact during Operation Phase

During the operation phase, main environmental impact is the noise generated by vehicle traffic. In accordance with the relevant provisions of *Specifications for Environmental Impact Assessment of Highway Projects (Draft)* (JTJ005-96), assessment range is 200 m from each side of road centerline. Class 4a standard daytime 70dB (A), nighttime 55 dB (A) in the *Environmental Quality Standard for Noise* (GB3096-2008) should be implemented for scattered residential buildings along the highways; and for schools and hospitals, class 2 standard daytime 60dB (A), nighttime 50 dB (A) in the *Environmental Quality Standard for Noise* (GB3096-2008) should be implemented. Therefore, during the operation phase, failure to take measures would affect the acoustic environment around the roads. In order to reduce the impact of noise, tall broadleaf trees can be planted on both road sides to prevent dust and reduce noise. Vehicle speed should be limited in the school and village sections; meanwhile, deceleration lanes and no honking signs should be set up in these sections as well. Since the roads in the project are all rural roads with low grade (grade 4), low traffic flow and low vehicle velocity (only 20 km/h), the acoustic environmental pollution by noise generated during vehicle traffic can be controlled within the national standard range to mitigate the impact on surrounding acoustic environment.

4.6.2 Acoustic Environment Control Measures

5.3.4 Measures for Mitigation of Acoustic Environmental Impact

During operation phase, main environmental impact is the noise generated by vehicle traffic. In order to reduce the impact of noise, tall broadleaf trees can be planted on both road sides in the near term to prevent dust and reduce noise. Vehicle speed should be limited in the school and village sections; meanwhile, deceleration

lanes and no honking signs should be set up in these sections as well. Since the roads in the project are all rural roads with low grade (grade 4), low traffic flow and low vehicle velocity (only 20 km/h), the acoustic environmental pollution by noise generated during vehicle traffic can be controlled within the national standard range to mitigate the impact on surrounding acoustic environment. But the control measures are proposed only for near-term out of limits. In case of exacerbated impact due to increased traffic flow over time, noise level should be monitored at all times and noise control measures should be taken gradually.

4.7 Environmental Impact Analysis and Controlling Measures of Solid Waste

4.7.1 Environmental Impact Analysis of Solid Waste

According to engineering analysis, the solid waste of the planed project is mainly produced during construction period in the following ways: discarded earth, construction waste, household refuse of constructors.

1. Discarded Earth during Construction Period

According to earthwork quantity estimated at engineering analysis phase, earth and rock should be transported to other places because the excavated volume is bigger than the buried volume. To avoid ecological influence caused by mass excavation, earth volume should be balanced as much as possible. The recommended excavated volume on *Project Feasibility* is 5877800m^3, used volume 1389400m^3,buried volume 1767800m^3, borrowed volume 38100m^3, discarded volume 4014300m^3. 80 soil disposal sites are set up along the project path, respectively distributed near the project roads about the distance of 3m to 300m , with the storage capacity of 4583900m^3. The sites can hold the discarded earth and rock of 4014300m^3.If effective measures are not taken, water and soil loss will possibly occur and ecological environment will be destroyed.

In accordance with environmental protection needs, discarded earth and rock should be compressed timely.Vegetation should be planted on it and other protective measures should be taken. Only in this way, can the ecological influence be reduced to the minimum level.More detailed content is discussed at chapter 4.3.3 ecological influence analysis of discarded earth.

2. Household and Construction Waste

Household waste refers to the various solid waste generated at constructor’s living area, including food waste, dross, packaging material for food and so on. The household waste is about 1 kg per day per person. Construction waste mainly refers to the demolition waste along the project path, debris produced during the road demolition and waste material at construction stage.

The project mainly focuses on upgrading and expanding the original rural high way; the majority of constructors are the nearby villagers who live in their own homes; therefore, the household and construction waste produced during construction period

is not much. If it is handled properly, no bad impact will be exerted on the vegetation and the land use after construction. The household waste will be gathered and used as fertilizer or disposed in the nearby waste-yard by the local environmental and sanitation department.

4.7.2 Controlling Measures of Solid Waste

1. Part of the local houses should be demolished, thus, certain amount of construction waste will be generated. Much of the waste construction material can be recycled and mainly used to build houses for relocated villagers to realize the minimization and reutilization of solid waste. Unrecyclable construction waste can be transported to the local prescribed area or waste-yard for landfill treatment.It should not be piled up randomly for fear that it will affect the local landscape and pollute the environment.

2. The project mainly focuses pm the rural highway; the construction is mainly at rural area; therefore, the household waste will be gathered, sterilized and used as fertilizer or disposed at the nearby waste-yard by the local environmental and sanitation department to reduce its influence on the environment.

3.The recommended excavated volume on *Project Feasibility* is 5877800m^3, used volume 1389400m^3, buried volume 1767800m^3, borrowed volume 38100m^3, discarded volume 4014300m^3. As to the excavated earth and rock, topsoil should be collected for afforesting use and cover-soil use of temporary land occupation; the recyclable earth should be used and the unrecyclable should be transported to the prescribed waste disposal area; in order to avoid water and soil loss and affect landscape, it should not be piled up randomly. 80 soil disposal sites are set up along the project path, respectively distributed near the project roads about the distance of 3m to 300m, with the storage capacity of 4583900m^3. The sites can hold the discarded earth and rock of 4014300m^3.In accordance with environmental protection measures, discarded earth and rock should be compressed timely.Vegetation should be planted on it and other protective measures should be taken to reduce the ecological influence to the minimum level.

4.8 Risk Assessment

4.8.1Risk Analysis

4.8.1.1 Overview of Risk Analysis on Road Transport of Dangerous Goods

After highway operation, sudden dangerous good transport accident will cause serious environmental pollution to the nearby areas. These dangerous goods are toxic, hazardous, flammable and explosive. Given dangerous good transport accidents are emergency traffic accidents, risk of such accidents can generally be reduced through management measures. In order to timely control accidents, fire protection system comprised of specialized staff and monitoring facilities should be established for

elimination and control of pollution. Transport agencies should strictly observe national traffic rules and regulations on transport of dangerous goods, provide vehicles with necessary prevention equipment, and attach warning signs. It is particularly important to offer drivers with professional skills training and transport safety education. In the event of a dangerous goods transport accident, such should be notified timely to the fire protection and environmental protection departments. Major pollution incidents should be reported progressively to higher level departments. If handled properly, the risk of dangerous goods transport can be very small.

4.8.1.2 Overview of Risk Analysis on Bridge Transport of Dangerous Goods during Operation Phase

Bridge operation will have a certain impact on water environment of rivers they span over. In particular, if vehicles transporting hazardous substances fall in the river from the bridge, the leaked toxic and hazardous substances will disperse with the flow, causing severe pollution of river water quality, and even posing a threat to life and health of downstream residents. Therefore, management and risk prevention need to be strengthened, in order reduce or avoid accidents.

4.8.1.3 Analysis of Fire Accident Sources

Vehicle accident, smoking or carriage of flammables when the road passes through the Siyetun Nature Reserve or forests along the route may lead to fire accident, damaging the reserve or wildlife along the route. Main types of fire accidents are as follows:

1. In the event of vehicle rollover, collision and other traffic accidents, gasoline, diesel fuel and other flammables within the vehicles or flammables being transported will be combusted, thereby causing fire accidents;

2. With the increase in road level, traffic and visitor flows increase, and fire accidents may occur due to carriage of flammables or smoking of people in vehicles.

Occurrence of road accidents is closely related to drivers. Occurrence of above traffic accidents are mostly due to vehicle overload, fatigue or drunk driving, etc. After accidents, many drivers are afraid to report such and thus delay the handling, thereby expanding the impact of accidents. Occurrence of fire accidents is linked to the quality of people in vehicles. Carriage of flammables or littering of cigarette butts

will increase the risk of fire accidents.

As the proposed highway passes through the Siyetun Nature Reserve, it is necessary to strengthen the management to guard against accidents. Carriage of flammables must be strictly prohibited for people who enter the reserve. Transport drivers must be educated and examined, and fatigue or drunk driving must be strictly prohibited. Transport articles must be checked, and transport of flammables and explosives through the nature reserve should be strictly prohibited. For those must be transported, approval from relevant administrative departments should be provided, as well as safe, reliable fire proof measures and specialized transport staff, in order to control fire from the source, and reduce the occurrence of fire accidents.

4.8.2 Risk Prevention Measures

4.8.2.1 Measures for Mitigation of Pollution Risks from Dangerous Goods Transport Accidents

Forest fire prevention design should be strengthened in the road sections across the Siyetun Nature Reserve, in order to avoid the impact of car and fire accidents on the reserve. Besides, fire warning signs should be set up. Surface drainage design in roads and bridges spanning over river segments and in village road sections should be strengthened to prevent the pollutant-containing water on the bridge deck and road surface from entering the rivers, thereby protecting the water quality. In order to avoid pollution of surface water, landscape recreational water, and especially drinking water, design of crash barriers on bridges and road sections should be strengthened. Meanwhile, speed limit signs should be set up.

4.8.2.2Hazardous article transportation

Precaution and emergency measure for the transportation accidents of hazardous article

Highway administrative department shall reinforce the management of hazardous article transportation; regulations relating to JT3130-88 Vehicle Hazardous Article Transportation Norm which has been published by Ministry of Communications shall be strictly enforced.

1. Education and training shall be provided in terms of the hazardous article transportation laws. For drivers and management staff occupied in hazardous article

transportation, they have to strictly follow relevant safety rules and operation procedures. Moreover, relevant laws and regulations issued by relevant department shall also be studied and mastered.

2. Strengthen the regional hazardous article transportation management

① Local road transport bureau shall establish the hazardous article transportation management control and shipping agency network;

② Conduct qualification authentication for shipping agency and carrier;

③ Conduct "navicert" "driving licence" and "supercargo" systems on hazardous article transportation; for vehicles occupied in hazardous article transportation, universal special mark shall be employed and fixed point detection system shall be implemented;

④ In hazardous article transportation, driver and conductor are not allowed to smoke, and they are not allowed to get close to open fire and high temperature sites. During the transportation, the drivers shall stay focused, and pay attention to the road sign; midway random parking is forbidden;

⑤ At important road segments, such as Siyetun Natural Protection Area, Longdijiang Scenic Area, and each river, warning sign of "reduce speed now and safe driving" shall be set. Vehicles occupied in hazardous article transportation shall keep a safety distance; overtaking and overspeed shall be strictly prohibited;

⑥ Major hazardous articles on the planned highway are diesel oils, gasoline, pesticides and chemical materials. Hence, in case of burning, explosion, pollution and poisoning during the transportation, drivers shall take relevant emergency measures as per relevant requirements based on the properties of the hazardous articles, so as to prevent the enlarging situation. Besides, they shall inform the local road transportation administration and relevant department (public security, fire control, protection zone management department, environmental protection and the government), and jointly take measures to eliminate the hazards.

⑦ Planned road runs across the Siyetun Natural Protection Zone. Hence, strengthening management is required so as to alert the occurrence of accidents. For people entering the protection zone, kindling materials are not required to carry; for drivers, education and inspection shall be conducted to restrain drunk driving and fatigue driving; inspection shall also be conducted on transported materials, and for

the transportations of inflammable and explosive articles, they are not allowed to pass through the protected zone. Besides, the transportation shall be acknowledged by relevant management department. Furthermore, safe and reliable fire protection measures and professional escorting staff are required. At last, kindling shall be controlled from the source, so as to reduce the occurrence of fire accidents.

3. Emergency management measures for sudden pollution incident

In terms of the management of sudden pollution incidents, the basic principle of environmental protection "prevention first & safety first" shall be followed. Especially for abrupt oil pollution and other pollution, contingency plan is required, and implementation of "prevention first & safety first" policy shall be put into practice. The details include the following aspects:

① Guideline for emergency work of sudden pollution incident is "prevention first", aimed to reinforce management.

② Besides the environment research for sudden pollution, corresponding accident emergency plan shall be established so as to reduce the accidents to the minimum.

Premise of the implementation is to fulfill the environmental risk assessment ; only by clarifying the risk type of the project, probability of accident happened and the following environmental influence can the targeted precautionary measures be adopted, thereby eliminating the hidden danger of accident happened or lower the probability of potential accidents.

Formulation of emergency response plan shall mainly include the following aspects:

① Establish sudden accidents response system;

② Relevant organization agency shall be set up in response to sudden accidents, including command coordination center, consultancy center, supervision center and remedial working group.

a. Command center

Led by highway construction unit, the command center consists of all the environmental departments, water supply company, water conservancy bureau, bureau of aquatic products, forestry bureau and cleaning company. All those departments are equipped with perfect communication equipment. With certain condition, social

interaction 110 alarm system shall be initiated to improve the response efficiency. The task is to establish the emergency system, coordinate the multilateral relations and command the actions of pollution accident elimination.

b. Consultancy center

It is mainly led by the scientific research department, and the major task is to make evaluations, and put forward suggestions relating to pollution prevention devices preparation and varieties, quantity and storage place of equipment based on historical materials and scientific achievements of natural resources data, Moreover, guideline of making instant and scientific decisions to deal with the emergency shall be formulated so as to offer suggestions to the command and coordination center on the basis of possible type of accidents, such as collision and explosion. Meanwhile, tracking events and making evaluations for the job shall be conducted, so as to improve the working procedure or making adjustment for the research direction.

c. Monitoring center

The center is mainly led by environmental or environmental monitoring department. Test cabinet shall be established and relevant analytical & testing equipment shall be provided, such as gas chromatograph, whose major task is to conduct analysis on the overall condition of water environment before submitting relevant reports.

d. Remedial working group

The group consists of professional staff in environmental protection (legal adviser will be hired if necessary), who is mainly in charge of legal research and negotiation for expense elimination and claiming of pollution damaging.

③Establish monitoring and reporting system

The major task of an emergency reaction system is to formulate operational plan with higher operability and better adaptation, which plays a great role in coping with emergencies. The functions include informing, evaluation, processing decision, dispatching and remedial actions. Moreover, daily supervision and information reception are mainly shouldered by the construction unit. In case of emergency (the first information source may come from one of the numerous sources with the general public included), the commanding unit will be immediately informed as per reporting procedure once the information is received, so as to activate the reaction system.

3. Training and drill

After the implementation of emergency plan for sudden accidents, relevant staff (including water conservancy, environmental protection and forestry departments) shall arrange regular drills and theoretical learning under assumptive conditions as per the requirement of the plan, so as to test the operability, adaptation and tightness of the plan. Furthermore, manpower shall be organized to compile *Emergency Manual for Sudden Accidents*. Each one can get one manual for consultation.

5 Public participation

Public participation is a two-way communication between project construction party and the general public. The establishment of public-participation environmental supervision & management regular mechanism will let the influenced general public get a timely understanding about environmental issue. Besides, they will be able to express their opinions through normal channel, so as to achieve scientization and democratization during the decision-making process, which is of vital importance for the decision and smooth implementation of construction scheme.

5.1 Purpose of public participation

① Let the public know the construction aim, scale, place and the possible afterward pollution as well as planned controlling measures after the normal operation; let the public express their opinions, thus realizing understanding and cooperation support.

② firsthand experience and intuitive feeling of the long-inhabited people for their living environment shall be employed as a auxiliary analysis on the current quality and level of the environmental elements, so as to reflect the objectivity of environmental evaluation, thus protecting the vital interests of the public.

5.2 General requirements of public participation

General requirements mainly include disclosing environmental information and asking for public opinions. Construction unit, committed environmental impact assessment agency, or administrative department in charge shall disclose information relating to environmental impact assessment as per relevant laws and regulations. In the process, ways well-known to the public shall be adopted, such as symposium, publicity on the local governmental websites, and questionnaires. The public can submit opinions in written form to the construction unit or environmental impact assessment agency through letter, fax, e-mail or other ways as required by the notice. On the other hand, the construction unit or environmental impact assessment agency shall file the source material of the collected feedbacks for further consultation.

The information issuing shall be conducted in an appropriate form which can be easily acquired and understood by the individuals, groups and organizations.

5.3 Organizing forms and investigation results of public participation

5.3.1 Organizing forms of public participation

①First publicity: on-site announcement

The first participation takes place in the local town and village, to paste announcements and inform the local people of the basic situation of the planned project. Content publicized is as follows (with site pictures):

Dejiang County (Tongren City) Utilizes World Bank Loan to Construct Rural Highway Project

Public Participation Announcement

According to Environmental protection law of the People's Republic of China and Interim Measures of Public Participation in Environmental Impact Assessment (2006[No.28]) issued by SEPA (State Environmental Protection Administration), the content and result of "World Bank Offers Loans to Tongren city, Guizhou Province for Rural Highway Project" are announced as Follows:

I Project name: World Bank Offers Loans to Tongren city, Guizhou Province for Rural Highway Project

Ⅱ Project overview: The construction content of World Bank Offers Loans to Tongren city, Guizhou Province for Rural Highway Project is formed by 86 rural highways, 30 bridges and capacity building projects in Dejiang and Sinan counties, with details shown in Table 1 and Table 2. The major content: (1) Dejiang rural highway construction project, including 59 level-four highways project totaling 415.705km and 18 bridges, totaling 539.5m; (2) Sinan rural highway construction project, including 27 level-four highways project totaling 230.717 km and 12 bridges, totaling 298.5m;(3) capacity building projects, including technical assistance, training and observation for the rural highway development planning.

Total investment is 1445.586 million yuan, in which 930 million(about 64.33%)is from world bank loan, and 515.586 million yuan (about 35.67%) belongs to domestic funds.

Ⅲ Possible influence of construction project on environment

① During the construction, dust, noise, waste water, wasted earthworks, construction waste and household refuse may cause certain influence on the environment; ② Project occupation changes the land utilization function, and destroy the earth surface, forest land, grassland and agrarian vegetation, which may affect the natural sceneries while incurring water and soil loss; ③ noise and tail gas during the operation period will cause certain influence on the surrounding environment.

Ⅳ Countermeasures in preventing or alleviating bad influence

1 Ecological environmental protection measures

(1) During the construction period, feasible plant protection measures shall be formulated, so as to reduce the destruction of forest vegetation; excessive logging is prohibited, and engineering or plant measures shall be taken to protect the bare lands; (2) damage to vegetation caused by permanent occupation of lands shall be fixed through road greening and planting trees & lawns in different places; for important trees, transplanting needs to be employed for protection; (3) temporary storage area shall be uncultivated land or land with less favorable farming conditions, and the lands shall be cleaned and recovered after the project; (4) try to avoid

cultivated land. To timely compensate the cultivated land in accordance with relevant policy, and help farmers with industrial structure adjustment. The aims is to guarantee that the production and living conditions of the farmers are not lower than that before; after the project, repeated cultivation shall be conducted for those temporary land and waste slag fields, so as to reduce the influence caused by temporary occupation of lands; (5) to strengthen construction management, and minimize the influence of temporary occupation of lands. For production and living wastes, universal treatment shall be employed. Random emission is not allowed, and environmental pollution as well as actions damaging the scenic areas shall be prohibited; (6) Implement the re-vegetation plan, and conduct vegetation recovery or re-cultivation after the initial completion of major and side slope projects.

2. Ambient air protection procedures

(1) Adopt the advanced construction technology, and select construction machinery and transport vehicles in accordance with the relevant state health standards, so as to make its emissions in conformity with the relevant standards of the state; (2) During the construction, watering for dust suppression shall be used in construction site and construction roads; reduce the open-air stack; set building envelope around the concrete mixing plant to reduce the pollution to ambient air; (3) transportation & construction road should avoid residential areas, and watering shall be employed for dust suppression; vehicles transporting ballast shall be covered human settlement, and adopt sprinkler control dust; Ship ballast vehicles should be covered by tarpaulin to prevent material floating in the sky and leakage along the way.

3. Controlling measures for noise pollution

(1) construction machinery shall be low noise equipment; vehicles passing the school, village and other sensitive areas should reduce speed; moreover, no honking is required in order to reduce the impact of traffic noise; in case of residential area within the reach of 200 meters, construction time should be arranged in a reasonable way; try to arrange machinery with great noise in the daytime. If it is a must, the construction shall not begin until approval in written form by the local government and the environmental protection department; (2) for the school, mechanical execution with big noise should avoid the school hours.

4. Controlling measures for waste water

Construction wastewater shall not be drained due to the recycling after sediment; the domestic wastewater from the camp buildings can be used in farm irrigation after simple septic-tank treatment.

Ⅴ Scope and material circumstance for asking for public opinions

1 Scope for asking for public opinions

All the towns, village committees, enterprise and public institutions and villagers involved in the project;

2 Material circumstances

(1) your opinion to this project construction; (2) if you agree with the road line selection and

direction; (3) if the building of the road is beneficial to the regional economic development; (4) your favorite compensation mode for the occupation of fields or demolition of some houses; (5) whether you understand highway land acquisition or compensation for demolition policies; (6) whether you will obey the land acquisition, demolition and resettlement decisions; (7) your favorite compensation mode for the occupation of fields or demolition of some houses; (8) what are the major influences for you due to highway construction; (9) suggested measures to reduce impact.

Ⅵ Main mode of public opinion

Telephone, letters, e-mail, etc.

Ⅶ **Project** implementation department and contact information

Project implementation unit: Dejiang County Transportation Bureau

Contact person: Luo Fei Tel: 13765615598

Address: Dejiang County Transportation Bureau Zip: 565200

Mailbox: 2013164173@qq.com

Project implementation units: Sinan County Transportation Bureau

Contact person: Jiang Wenbing Tel: 13908560656

Address: Sinan County Transportation Bureau Zip: 565100

Mail box: 695494610@qq.com

Ⅷ Environmental impact assessment departments and contact information

Environmental impact assessment unit name: Guizhou Academy of Environmental Science and Designing

Contact person: Zhu Keyong, Feng Peisong, Zeng congjiang

Phone number: 0851-5503689, 5505323

Address: No. 217, Qianlingshan Rd, Guanshanhu Disrtrict, Guiyang City

Zip code: 550081 Mailbox: 514185480 @qq.com

Ⅸ Validity time Dec. 4, 2014~Dec.13, 2014

Attachments: Table 1 is the Schedule of Planned Highway Project, with the content in accordance with the report 2.1-1;

Table 2 is the Schedule of Planned Bridge Project, with the content in accordance with the report 2.2-2.

Dejiang County Transportation Bureau (seal)

Sinan County Transportation Bureau (seal)

Dec.4, 2014

First public participation pictures in Dejiang County

First public participation pictures in Sinan County

Figure 5.3-1 First public participation pictures

(2) Second publicity: present full-text publicity for the first draft of environmental impact assessment

After the compilation completion of "World Bank Offers Loans to Tongren city, Guizhou Province for Rural Highway Project" (first draft), the result will be fully announced on the websites of People's Government of Dejiang County (http://www.dejiang.gov.cn) and People's Government of Sinan County (http://www.sinan.gov.cn) from Dec.11, 2014 to Dec.20, 2014. Attached picture 5.3-2 refers tothe screenshot of online announcement of public participation.

(3) Symposium

① Symposium overview: according to relevant requirements, after the announcement of "World Bank Offers Loans to Tongren city, Guizhou Province for Rural Highway Project" (first draft) in local government websites for ten days, the construction units shall hold the public participation symposium in local government office near individual projects. The participants shall be the township or online 10 days later, the construction unit in the project is located township (town) government office held a public participation in conferences, participants are mainly village cadres, villager representatives, and people in charge of transportation management station.
For on-site photos, please find the attached pictures 5.3-3.

② Topic for symposium: the symposium has set several topics according to the features of the project (for details, please see 5.3-1)

5.3-1 Topics for the symposium

Topics	Opinion or suggestions	Note
(1)General opinions for this rural highway and bridge projects		
(2)Positive significance of the project		
(3)Suggestions or opinions for the project		
①Highway route selection, direction and the Bridge location		
②Safety problem（especially passing the village or school sections）		
③ environmental protection measures during the construction and operation period		
④ Location of construction sites and spoil ground		
⑤ land acquisition, demolition, resettlement and compensation		

(4) Give out public participation questionnaires

Give out public participation questionnaires among township government, village committee and villager representatives involved in the project, with the content seen in 5.3-2 (for individuals), and 5.3-3 (for group).

(1) Screenshot of public participation announced by People's Government of Dejiang County

(2) Screenshot of public participation announced by People's Government of Sinan County

Figure 5.3-2 Screenshot of Second online announcement of public participation

Spot Pictures of Public Participation in Symposium in Dejiang County

Spot Pictures of Public Participation in Symposium in Sinan County

Figure 5.3-3 Spot Pictures of Public Participation in Symposium

Table 5.3-2 World Bank Offers Loans to Tongren city, Guizhou Province for Rural Highway Project" Public Opinion Consultation Chart

Name： _____ **Gender：** _____ **Age：** _____ **Education degree：** _____ **Occupation：** ____ **Residence：** _____ **Contact number：** _____
Project overview： The construction content of World Bank Offers Loans to Tongren city, Guizhou Province for Rural Highway Project is formed by 86 rural highways, 30 bridges and capacity building projects in Dejiang and Sinan counties, with details shown in Table 1 and Table 2. The major content: (1) Dejiang rural highway construction project, including 59 level-four highways project totaling 415.705km and 18 bridges, totaling 539.5m; (2) Sinan rural highway construction project, including 27 level-four highways project totaling 230.717 km and 12 bridges, totaling 298.5m;(3) capacity building projects, including technical assistance, training and observation for the rural highway development planning. Total investment is 1445.586 million yuan, in which 930 million（about 64.33%）is from world bank loan, and 515.586 million yuan (about 35.67%) belongs to domestic funds.
1 Your attitude towards the project Support□ Not support□ Doesn't matter□
2 If you agree with the route selection, direction and bridge location Yes □ No□ No idea□
3 Influence of the project on your life and income: positive□ negative□ no□
4 The environmental quality of your living area good□ ordinary□ bad□
5 environmental problem you care most during the construction noise□ geological disaster□ ecological damage□ landscape destruction□ water pollution□ air pollution□
6During the operation period, what is the greatest influencing factor to the environment? noise □ tail gas□ water pollution□ dust□
7 Your favorite compensation mode for the occupation of fields or demolition of some houses; monetary indemnity□ Resettlement in other places□ Others□（Please write in detail）
8 Effect of the project on regional economic development Huge□ Little □ No□
9 Can you accept the following environmental influence Yes□ No□ Doesn't matter□
10 Can you obey land acquisition, demolition and resettlement? Yes□ No□ Obey with conditions□
11 Suggested measures to alleviate noise highway greening□ ventilation sound proof window□ avoid villages □ others□
Other advices or suggestions:

Please mark √ in the □ on the point you are agree with.

Table 5.3-3 Tongren Rural Road Project

Financed by the World Bank Loan

Consulting table of public opinions (group)

Group name: (sealed) Contact number:

Project overview: the construction content of Tongren rural road project financed by the World Bank loan contains the rural highways, newly built bridges and capacity building projects of Dejiang County and Sinan County. The main construction content are as following: (1) Dejiang rural highway construction project, including 59 four level highway construction with total length of 415.705km, and 18 bridges with total length of 539.5m; (2) Sinan rural highway construction project, including 27 four level highways with total length of 230.717 km, and 12 bridges with total length of 298.5m; (3) capacity building projects, including the support to rural highway development planning, training and investigation.

The proposed total investment of construction project is RMB 1445586000, including RMB 930,000,000 (about 64.33%) of World Bank loan and RMB 515,586,000 (about 35.67%) of domestic funds.

1. Opinion about this construction: Support □ Oppose □ Do not care □

2. Do you agree with the routes and direction selection of highways and location of bridges" Agree □ Disagree □ Have no idea □

3. The influence of this construction to economic development of local region and units:
Positive effect □ Negative effect □ No effect □

4. How about the current local environmental quality of this unit? Good □ General □ Bad □

5. The most concerned environment problems during the process of this construction:
Noise □ Geologic disaster □ Ecological damage □ Landscape damage □ Water pollution □ Air pollution

6. The major influence to environment during the operation period after completion of this project:
Noise □ Tail gas □ Water pollution □ Dust □

7. The influence of this construction to the living quality of local people:
Positive effect □ Negative effect □ No effect □

8. The influence of this construction to tourist industries:
Positive effect □ Negative effect □ No effect □

9. The influence of this construction to ecological environment and agricultural resources along the lines:
Positive effect □ Negative effect □ No effect □

Other comments or suggestions:

Please click √ in the □ you agree with.

5.3.2 Statistics of survey result

(1) Announcement posting

During our site survey and interviewing period, people long the line of this project strongly support this construction and hope to start construction as soon as possible. Within 10 days of posting announcement, no calls or letters are received for opposing this construction by construction unit and EIA unit.

(2) Result of full text publicity

After the completion of "Tongren Rural Road Project Financed by the World Bank Loan" (first draft), we have publicly show the whole text in Dejiang people's government website and (http://www.dejiang.gov.cn) and Sinan people's government website (http://www.sinan.gov.cn). During the publicity period, no calls or letters are received for opposing this construction by construction unit and EIA unit.

(3) Result of the conversazione

All the participants of the conversazione declare themselves and give some constructive opinions to the project construction. Please see table 5.3-4 for detail date, position and participant number of conversaziones; please see table 5.3-5 for general questions and suggestion summary of each conversaziones.

Table 5.3-4 Statistic table for conversazione convening condition of public participants

Serial No.	Date	Position	Participant number	Remarks
I. Dejiang county				
1	2014.12.18	Government conference room	12	Hexing town
2	2014.12.16	Tongxin community conference room	12	Tongjing township
3	2014.12.15	Government conference room	10	Nan'gan township
4	2014.12.17	Chaoxi village conference room	10	Jiancha town
5	2014.12.13	Jieshang community conference room	11	Gonghe town
6	2014.12.14	Qiaotou community conference room	10	Qinglong subdistrict office
7	2014.12.15	Government conference room	11	Yantang township
8	2014.12.17	Xintian village conference room	11	泉口镇 Quankou town
9	2014.12.14	Government conference room	15	Qianjia township
10	2014.12.18	Guanlin village conference room	10	Jingjiao township
11	2014.12.14	Anshan village	15	Longquan

		conference room		township
12	2014.12.13	Conference room of Party committee office and government offices	15	Changbao town
13	2014.12.13	Government conference room	21	Fuxing town
14	2014.12.14	Xinzhai community conference room	10	Yushui subdistrict office
15	2014.12.15	Government conference room	10	Chaodi town
16	2014.12.19	Wanba community conference room	16	Shaxi township
17	2014.12.18	Lizishui village conference room	10	Gaoshan Town
18	2014.12.19	Wenping community conference room	17	Wenping town
19	2014.12.21	Xingjie village conference room	10	Fengxiangxi town
20	2014.12.21	Duoping village conference room	11	Changfeng town
II. Sinan county				
21	2014.12.28	Village committee office of Nan'gan village	16	Yangjiaao township
22	2014.12.14	Baowei village office	11	Kuanping township
23	2014.12.21	Home of secretary Tan Yong of Liangtiankan village	17	Kuanping Township
24	2014.12.16	Village committee office of Qunshan village	11	Wenjiadian town
25	2014.12.17	Village committee office of Hongqi village	10	Wenjiadian town
26	2014.12.17	Village committee office of Tunshan village	12	Wenjiadian town
27	2014.12.12	Village committee office of Zhangjiaao village	23	Liangshuijing town
28	2014.12.14	Village committee office of Shangbatian village	14	Wengxi town
29	2014.12.14	Village committee office of Shanxing village	11	Wengxi town
30	2014.12.14	Village committee office of Fujiazhai village	15	Wengxi town
31	2014.12.10	Home of Luo Shizhen of Taoziyan village	15	Daheba town
32	2014.12.11	Village committee office of Shanxing	17 17	Shuangtang subdistrict

		village		committee office
33	2014.12.11	Home of Yang Shifu of Xinmin village	17	Sandaoshui township
34	2014.12.12	Home of Wu Zhongwen of Shuanghe village	19	Sandaoshui township
35	2014.12.11	Home of Yuan Jingtang of Xintang village	10	Sandaoshui township
36	2014.12.18	Village committee office of Heping village	11	Dabachang town
37	2014.12.13	Village committee office of Jinggang village	19	Zhangjiazhai town
38	2014.12.16	Village committee office of Chaxi village	10	Qinggangpo town
39	2014.12.15	Village committee office of Zhongling village	27	Silin town

Table 5.3-5 Topic of conversazione

Topic for discusstion	Comments or suggestions	Remarks
() Overall opinion about this implementation of rural highways and bridge construction.	Participants all agree and support the implementation of this project.	
(2) The positive significances of this project construction.	Speed up regional traffic development, bring traffic convenience for regional villagers, drive regional economic development, and benefit regional villagers.	
(3) Comments or suggestions about this project construction	Pay attention to the interests of the whole by reduce ecology and environment damage; implement the project construction by relevant authorities; compensate timely according to relevant files and regulations of occupied plantations and removed houses.	
① Routes and direction selection of highways and location of bridges	No opinion	
② Security issue (especially the section near villages and schools)	Hope construction party will optimize design, reinforce construction supervision, adjust field operation time and minimize environmental influence along the line; protect involved protected objects along the line strictly according to EIA requirements and methods.	
③ Environmental protection measures during construction and operation period	Construct according to requirement of EIA and relevant authorities during construction process; intensify virescence level and investment of conservation of water and soil along the line, especially should increase investment to unfavorable geology; try to reduce damage to environment and ecology.	

④ Location problem of construction camps and spoil ground	Set construction camps strictly according to requirement of EIA. Choose the spoil ground according to the advice and requirement of EIA and regulations of relevant authorities, and no indiscriminate digging or discarding is allowed.	
⑤ Land acquisition, demolition, arrangement and compensation problems	The design organization is recommended to optimize design and try his best to reduce quantity of occupies plantations, forest lands and demolition; compensate timely to occupied or removed places according to relevant files and demolition resettlement scheme; relevant authorities are recommended to make public land requisition and demolishing resettlement scheme.	

(4) Questionnaire survey result

This project has given out 674 public opinion consulting tables and took back 674 tables. The return rate is 100%. Including which, personal there are 480 opinion consulting tables and 480 tables were took back (228 of Dejiang county and 252 of Denan county); 194 consulting tables of social groups and units and 194 tables were took back (115 of Dejiang county and 79 of Sinan county).

(1) Individuals

This public participating and survey mainly concerns to people from surrounding regions involved in this project. Please table 5.3-6 for the hierarchical structure of profession, sex, ago, ethic group and culture of respondents.

Table 5.3-6 Public respondents' constitution of construction project environment influence evaluation

Item	Sex	Quantity (person)			Ratio (%)
		Dejiang county	Sinan county	Total	
Age	Equal to or under 30	16	14	30	6.3
	31-40	65	45	110	22.9
	41-50	94	94	188	39.2
	51-60	35	43	78	16.3
	Above 60	15	56	71	14.8
	Not filled	3	0	3	0.6
Culture degree	Undergraduate or higher	4	3	7	1.5
	Technical secondary	25	22	47	9.8
	Senior high school	45	20	65	13.5
	Junior high school	114	138	252	52.5
	Primary school	38	66	104	21.7

	Illiteracy	2	3	5	1.0
Sex	Male	186	226	412	85.8
	Female	42	26	68	14.2
Profession	Farmer	118	205	323	67.3
	Individual	5	0	5	1.0
	Cadre	61	47	108	22.5
	Others	44	0	44	9.2

From table 5.3-6 we can see, this public survey concerns people from all circles, reflecting the opinions of farmers and cadres involved by this project. The survey age also includes middle ago, and culture degree from primary school, technical secondary school to university. Therefore, we believe the result of this survey is reliable for its representativeness, universality and high randomness.

(2) Consulting table of opinions of social groups and units

The social group survey list includes 194 units of institutions, enterprises and public institutions, and village committees (115 of Dejiang, 79 of Sinan). Please see table 5.3-7 for survey unit list.

Table 5.3-7 Table of survey units

No.	Unit name	No.	Unit name
I. Dejiang county			
1	Village committee of Niaoping village, Hexing town, Dejiang county	59	Anshan Primary School of Longquan township, Dejiang county
2	Village committee of Qinglonggang village, Hexing town, Dejiang county	60	Village committee of Anshan village, Tujiazu township, Lonngquan, Dejiang county
3	Village committee of Changxian village, Hexing town, Dejiang county	61	Animal Husbandry &. Veterinary Station of Tujiazu township, Lonngquan, Dejiang county
4	Dexing Bureau of Finance, Hexing Branch	62	Water station of Tujiazu township, Lonngquan, Dejiang county
5	Village committee of Hepeng village, Hexing town, Dejiang county	63	People's government of Tujiazu township, Lonngquan, Dejiang county
6	Village committee of Longxi village, Hexing town, Dejiang county	64	Traffic management station of Tujiazu township, Lonngquan, Dejiang county
7	Supervision and management station for security production of Hexing town, Dejiang county	65	People's government of Changbao town, Dejiang county
8	General office of party policy of Tujiazu township, Tongjing township, Dejiang county	66	Supervision and management station for security production of Changbao town, Dejiang county
9	Village and town planning and construction station of Tujiazu township, Tongjing township, Dejiang county	67	Traffic management station of Changbao town, Dejiang county
10	Forestry environmental protection station of Tujiazu township, Tongjing, Dejiang	68	Social work service center of Changbao town, Dejiang county
11	Neighborhood committee of Tongxin community, Tujiazu, Tongjing, Dejiang county	69	Agricultural service center of Changbao town, Dejiang county
12	Supervision and management station for security production of Tujiazu township, Tongjing, Dejiang county	70	Immigrant station of water resource and hydropower engineering of Changbao town, Dejiang county
13	Dexing Bureau of Finance, Tongjing Branch	71	Village committee of of Yanpen countu, Fuxing town, Dejiang county

14	Traffic management station of Tujiazu township, Tongjing, Dejiang county	72	Village committee of Meizi village, Fuxing town, Dejiang county
15	Comprehensive treatment office of social management of Tujiazu township, Tongjing, Dejiang county	73	Village committee of Nanxi village, Fuxing town, Dejiang county
16	Poverty relief and development station of Tujiazu township, Nan'gan, Dejiang county	74	Village committee of Kedian village, Fuxing town, Dejiang county
17	Dexing Bureau of Finance, Nan'gan Branch	75	Neighborhood committee of Qixing community, Fuxing town, Dejiang county
18	Territorial resources management station of Nan'gan township, Dejiang Land and Resources Bureau	76	Urban service station of Yushui subdistrict office, Dejiang county
19	Supervision and management station for security production of Tujiazu township, Nan'gan, Dejiang county	77	The Fourth Primary School of Dejiang county
20	Comprehensive service center of agricultural technology of Tujiazu township, Nan'gan, Dejiang county	78	Neighborhood committee of Xinzhai community, Yushui subdistrict, Dejiang county
21	Social affair office of Tujiazu county, Nan'gan, Dejiang county	79	Yushui subdistrict office of Dejiang county
22	Village committee of Chaoxi village, Jiancha town, Dejiang county	80	Jiangao livestock farms of Dejiang county
23	People's government of Jiancha town, Dejiang county	81	Traffic management station of Yushui subdistrict office, Dejiang county
24	Zhonghuo village, Jiancha town, Dejiang county	82	Supervision and management station for security production of Chaodi town, Dejiang county
25	Branch committee of Songxi village, Zhonggong Jiancha town	83	Comprehensive treatment office of social orders of Chaodi town, Dejiang county
26	Branch committee of Gaozhu village, Zhonggong Jiancha town	84	Water affairs station of Chaodi town, Dejiang county
27	Immigrant station of water resource and hydropower engineering of Gonghe town, Dejiang county	85	Agricultural service center of Chaodi town, Dejiang county
28	Social affairs office of Gonghe Town, Dejiang county	86	Traffic management station of Chaodi town, Dejiang county
29	Village and town planning and construction station of Gonghe town, Dejiang county	87	Territorial resources management station of Chaodi town, Dejiang Land and Resources Bureau
30	Forestry environment protection station of Gonghe town, Dejiang county	88	Population and family planning office of Tujiazu township, Shaxi, Dejiang county
31	Supervision and management station for security production of Gonghe town, Dejiang county	89	Shaxi Power Supply Administration of Dejiang Power Supply Administration
32	Poverty relief and development station of Gonghe town, Dejiang county	90	Shaxi kindergarten of Dejiang county
33	Dejiang Town And Country Planning And Construction Bureau	91	Junior Primary School of Tujiazu township, shaxi, Dejiang county
34	Qinglong subdistrict office of Dejiang county	92	Center Wan Primary School of Tujiazu township, Shaxi, Dejiang county
35	Highway transportation management station of Dejiang county, Guizhou	93	Center health center of Shaxi township, Dejiang county
36	Animal Husbandry &. Veterinary Station of Dejiang county	94	Shaxi Credit Union of Dejiang Rural Credit Cooperatives
37	Neighborhood committee of Qiaotou community, Qinglong subdistrict, Dejiang county	95	Village committee of Lizishui village, Gaoshan town, Dejiang county
38	Territorial resources management station of Yantang township, Dejiang Land and Resources Bureau	96	Poverty relief and development station of Gaoshan town,Dejiang county
39	Village and town planning and construction station of Tujiazu township, Yantang, Dejiang county	97	Supervision and management station for security production of Gaoshan town, Dejiang county
40	Supervision and management station for security production of Yantang township, Yantang, Dejiang county	98	Water affairs station of Gaoshan town, Dejiang county
41	Social affairs office of Tujiazu township, Yantang, Dejiang county	99	Traffic management station of Gaoshan town, Dejiang county
42	Traffic management station of Tujiazu township, Yantang, Dejiang county	100	Territorial resources management station of Wenping town, Dejiang Land and Resources Bureau

43	Population and family planning office of Tujiazu township, Quankou, Dejiang county	101	Neighborhood committee of Wenping community, Wenping town
44	Human resource and social affairs service center of Tujiazu township, Quankou, Dejiang county	102	Supervision and management station for security production of Wenping town, Dejiang county
45	Village committee of Xiantian village, Quankou town, Dejiang county	103	People's government of Wenping town, Dejiang county
46	Social affairs office of Quankou town, Dejiang county	104	Planning and construction station of Wenping town, Dejiang county
47	People's government of Quankou town, Dejiang county	105	Population and family planning office of Xiangxi town, Dejiang county
48	Supervision and management station for security production of Tujiazu township, Quankou, Dejiang county	106	Social affairs office of Xiangxi town, Dejiang county
49	Village committee of Shuba village, Tujiazu township, Qianjia, Dejiang county	107	Traffic management station of Xiangxi town, Dejiang county
50	Water Diversion Management Bureau of people's government of Tujiazu township, Qianjia, Dejiang county	108	Dejiang Bureau of Finance, Xiangxi Branch
51	Village committee of Meijia village, Tujiazu township, Qianjia, Dejiang county	109	The disabled association of Xiangxi town, Fengxiang, Dejiang county
52	Village committee of Tianba village, Tujiazu township, Qianjia, Dejiang county	110	Village committee of Xingjie village, Xiangxi town, Qianjia, Dejiang county
53	Traffic management station of Tujiazu township, Qianjia, Dejiang county	111	Branch committee of Tujiazu township, Changfeng, Zhonggong Dejiang county
54	Farmers' professional cooperative of Meishi tea planting of Dejiang county	112	Branch committee of Nongchen village, Tujiazu township, Changfeng, Zhonggong
55	Village committee of Guanlin village, Tujiazu township, Jingjiao, Dejiang county	113	Branch committee of Changfeng community, Changfeng, Zhonggong
56	Village committee of Jiaokou village, Tujiazu township, Jingjiao	114	Branch committee of Shengba village, CHangfeng, Zhonggong
57	Village committee of Xinkeng village, Tujiazu township, Jingjiao	115	Branch committee of Xiaoping village, Changfeng township, Zhonggong
58	Village committee of Xishui village, Tujiazu township, Jingjiao, Dejiang county		
II. Sinan county			
1	Village and town management station of Yingwuxi town, Sinan county	41	Territorial resources management station of Shuangtang subdistrict, Sinan county
2	Security supervision station of Yingwuxi town, Sinan county	42	Human society office of Shuangtang subdistrict, Sinan county
3	Poverty supporting station of Yingwuxi town, Sinan county	43	Cooperative medical service office of Shuangtang subdistrict, Sinan county
4	Cultural service center of Yingwuxi town, Sinan county	44	People's government of Daheba town, Sinan county
5	Cooperative medical service management station of Yingwuxi town, Sinan county	45	Traffic management station of Daheba town, Sinan county
6	People's government of Tujiazu township, Silin, Sinan county	46	Majiashan village, Daheba town, Sinan county
7	Village and town management station of Silin township, Sinan county	47	Taoziyan village, Daheba town, Sinan county
8	Supervision and management station for security production of Silin, Sinan county	48	Traffic management station of Wengxi town, Sinan county
9	Ganchangba village, Silin township, Sinan county	49	Poverty supporting station of Wengxi town, Sinan county
10	Zhongling village, Silin township, Sinan county	50	Wengxi community, Wengxi town, Sinan county
11	Sijiao village, Silin township, Sinan county	51	Antang village, Wengxi town, Sinan county
12	Banlian village, Silin township, Sinan county	52	Finance branch of Wengxi town, Sinan county

13	Tianzhuang village, Qinggangpo town, Sinan county	53	People's government of Liangshuijing town, Sinan county
14	People's government of Qinggangpo town, Sinan county	54	Shuijing village, Liangshuijing town, Sinan county
15	Security supervision and management station of Qinggangpo town, Sinan county	55	Nanpenpo village, Liangshuijing town, Sinan county
16	Water affairs station of Qinggangpo town, Sinan county	56	Qingganglin village, Liangshuijing town, Sinan county
17	Traffic management station of Zhangjiazhai town, Sinan county	57	Zhangjiaao, Liangshuijing town, Sinan county
18	People's government of Zhangjiazhai town, Sinan county	58	Traffic management station of Hepengxi town, Sinan county
19	Jinggang village, Zhangjiazhai town, Sinan county	59	Village and town management station, Hepengxi town, Sinan county
20	Nanshan village, Tianqiao township, Sinan county	60	Security supervision and management station of Hepengxi town, Sinan county
21	Qianjing Primary School of Tianqiao township, Sinan county	61	Immigrants working station of Hepengxi town, Sinan county
22	People's government of Tianqiao township, Sinan county	62	Liangqiao village, Hepengxi town, Sinan county
23	Meizibao village, Tianqiao township, Sinan county	63	People's government of Hepengxi town, Sinan county
24	Traffic management station of Tianqiao township, Sinan county	64	Tunshan village, Wenjiadian town, Sinan county
25	Civil administration service center of Banqiao township, Sinan county	65	Hongqi village, Wenjiadian town, Sinan county
26	Resource center of Banqiao township, Sinan county	66	Human resource center of Wenjiadian town, Sinan county
27	Human resource management center of Banqiao township, Sinan county	67	Rural cooperative of Wenjiadian town, Sinan county
28	People's government of Banqiao township, Sinan county	68	Population planning office of Wenjiadian town, Sinan county
29	Traffic management station of Banqiao township, Sinan county	69	Traffic management station of Wenjiadian town, Sinan county
30	Traffic management station of Dabachang town, Sinan county	70	People's government of Yangjiaao township, Sinan county
31	Heping village, Dabachang town, Sinan county	71	People's Congress presidium of Yangjiaao township, Sinan county
32	Guihua village, Dabachang town, Sinan county	72	Work contacting group of Yangjiaao township, Sinan county
33	People's government of Dabachang town, Sinan county	73	Traffic management station of Yangjiaao township, Sinan county
34	Xintang village, Sandaoshui township, Sinan county	74	Sinan Finance Bureau, Yangjiaao Branch
35	People's government of Sandaoshui township, Sinan county	75	Population planning management office of Yangjiaao township, Sinan county
36	Traffic management station of Sandaoshui township, Sinan county	76	Human resource center of Yangjiaao township, Sinan county
37	Xinmin village, Sandaoshui township, Sinan county	77	Agricultural development center of Yangjiaao township, Sinan county
38	Shuanghe village, Sandaoshui township, Sinan county	78	Supervision and management center of security production of Yangjiaao township, Sinan county

39	Shuangtang subdistrict office of Sinan county	79	Nan'gan village, Jiaao township, Sinan county
40	Security management station of Shuangtang subdistrict, Sinan county		

Please see table 5.3-8 for detail of personal survey result statistics, and table 5.3-9 for detail of group survey result statistics.

Table 5.3-8 Project Environmental Impact Assessment Public Opinion Consulting Table Statistics Results (Individual)

Survey Contents		**Opinion statistics**		
Serial No.	**Questions**		**Quantity (person)**	**Valid questionnarire ratio (%)**
1	Opinion of the engineering construction	Support	480	100
		Oppose	0	0
		Not care	0	0
2	Do you agree the road choice and direction and the site selection of bridges	Agree	480	100
		Disagree	0	0
		No idea	0	0
3	What kinds of effect the project construction will bring to your income	Positive	430	90
		Adverse	0	0
		No effect	47	10
4	How do you think your current living emvironment quality	Good	349	73
		Common	62	13
		Worse	80	17
5	Which environmental problems in the process of the project construction do you concern most	Noise	317	66
		Geological disaster	67	14
		Ecological damage	65	14
		Landscape damage	6	1
		Water pollution	14	3
		Air pollution	22	5
6	Which has the greater influence on environment during the operation after the competion of the project	Noise	332	69
		Tail gas	62	13
		Water	13	3
		Dust	96	20
7	Road construction may occupy some land and need to remove some houses, which kind of compensation way do you prefer	Monetary indemnity	443	92
		Relocation	32	7
		Others	7	1
8	How much do you think the engineering	Greter	480	100

	construction will exert on local economic development	Not much	0	0
		Non	0	0
9	Can you accept the environmental influence of the project construction	Yes	480	100
		No	0	0
		Not care	0	0
10	Do you obey land acquirisition, demolition and relocation	Yes	479	99.8
		No	0	0
		Conditionally	1	0.2
11	Which measure do you suggect to reduce noise efefct	Road greeting	458	95
		Ventilationn sound insulation	0	0
		Bypass villages	4	1
		Others	18	4

Table 5.3-9 Project Environmental Impact Assessment Public Opinion Consulting Table Statistics Results (Group)

Survey Contents		**Opinion statistics**		
Serial No.	**Questions**	**Serial No.**	**Questions**	**Serial No.**
1	Opinion of the engineering construction	Support	194	100
		Oppose	0	0
		Not care	0	0
2	Do you agree the road choice and direction and the site selection of bridges	Agree	194	100
		Disagree	0	0
		No idea	0	0
3	What kind of effect will the project construction exert on the economic development of the region and the unit	Postitive	183	94
		Adverse	0	0
		No effect	11	6
4	How is the environmental quality of your current location	Good	151	78
		Common	26	13
		Worse	17	9
5	Which environmental problems in the process of the project construction do your concern most	Noise	119	61
		Geological disaster	47	24
		Ecological damage	20	10
		Landscape damage	4	2
		Water pollution	19	10
		Air pollution	6	3

6	Which has the greater influence on environment during the operation after the completion of the project	Noise	100	52
		Tail gas	43	22
		Water	3	2
		Dust	65	34
7	How do you think your current living emvironment quality	Good	194	100
		Common	0	0
		Worse	0	0
8	What much effect do you think the project construction will exert on the development of tourist industries	Greter	170	88
		Not much	1	1
		Non	23	12
9	What much effect do you think the project construction wil exert on the passing ecotope and agricultural resourses	Greter	43	22
		Not much	54	28
		Non	97	50

Table 5.3-8 individual survey results show that:

(1) In questionnaire survey of individual views on the project, 100% of the subjects support the project and there is no opposition, showing the project enjoys high approval ratings in the local community.

(2) As for the questionnaire investigation about the road choice and direction and the site selection of bridge in the project, 100% of subjects agree such choices and there is no opposition, showing the project indeed can improve the travel conditions for local villagers in road choice and direction and the site selection of bridge

(3) In the investigation about the individual subjects' opinion of the effect of construction of the project will exert on the economic development of the region and the unit, 90% ones of the survey group think it will exert beneficial effects and with 10% ones hold it will exert no effect.

(4) On the survey of current local environment quality, 73% of respondents believe that environmental quality is good and 13% of the survey group thinks it is common.

(5) As for the most concerned environmental problems, 66% individuals concern about the noise the most and 14% of the survey individuals care of geological disasters; After the completion of the project, 69% think noise will have the biggest impact on the environment, because the project is a traffic road; when selecting the roads, the travel convenience should be considered; besides, the effects of noise on the local villagers also needs to be considered.

(6) When it comes to best way to compensate since the road construction may occupy some land and some remove some houses, 92% of respondents choose that monetary compensation and 7% of relocation.

(7) As for the effect of the project construction on the development of local economy, 100% of respondents think it has greater effect. For the question whether you accept the impact of the project construction on environmental, 100% of respondents think they can accept.

(8) In the survey whether you obey the land acquisition, demolition and relocation, 99.8% obey while 0.2% ones obey conditionally; monetary compensation should be carried out to the villagers in accordance with the standard.

(9) As for the measure of reducing the effects of the construction noise, 95% of respondents recommend road greening.

Table 5.3-9 group research results show that:

(1) In the questionnaire about the group's opinions of the project, the number of support account for 100% the subjects support the project and there is no opposition, showing the project enjoying high approval ratings in the local community.

(2) As for the questionnaire investigation about the road choice and direction and the site selection of bridge in the project, 100% of subjects agree such choices and there is no opposition, showing the project indeed can improve the travel conditions for local enterprises, government and other social groups in road choice and direction and the site selection of bridge

(3) As for the effect of the project construction on the economic development of the region and the unit, 94% of the survey group choose beneficial effects and 6% choose no impact and no group chooses adverse effect.

(4) On the survey of current local environment quality, 78% of respondents believe that environmental quality is good and 13% of the survey group thinks it is common.

(5) As for the most concerned environmental problems, 61% of the survey group the choose noise and 24% ones choose geological disasters; after the completion of the project, 52% of the survey group think the noise will has the greatest impact on the environment because the project is a traffic road; when selecting the roads, the travel convenience should be considered; besides, the effects of noise on the local villagers also needs to be considered.

(6) For the question whether the project will benefit people's quality of life of the region, 100% survey group think yes; 88% ones think it will have great role in the development of tourist industry.

5.4 Feedback of the problems raised by the public and the implementation

This project successively has proceeded public participation, notice posting, online publicity, questionnaire survey, and panel discussion. Aiming at the opinions and suggestions commonly concerned and proposed by the local residents and people

from all walks of life in the survey of pubic participation, the appraisal units have sorted, classifies and summarized them, proposed handling suggestions, and handed them to the construction units. Accordingly, the construction units carefully answered these questions. Please refer to Table5.4-1 for details.

Table 5.4-1 Summary Table of Adoption and Suggestion of Public Comments

Serial No.	Summary of major public comments	Adoption and suggestion of public comments by evaluation unit	Adoption of public comments by construction unit
1	All the people involved in the investigation supported the construction of the project, and expected to implement it as soon as possible.	Construction unit should accelerate the processing of relevant formalities to strive for an early start, and well fulfill the requirements of the National Development and Reform Commission, Guizhou Province Development and Reform Commission, and Tongren municipal party committee and government.	Construction unit is accelerating the processing of relevant formalities, and has completed most of the work now. The Ministry of Finance of the National Development and Reform Commission issued the file Fagaiwaizi [2013] No. 1276 *Ask for Instructions about the Alternative Project Planning World Bank Loan for 2014-2016 Fiscal Year* (2013.7) and Fagaiwaizi [2013] No.1483 *Notice for Instructions about the Alternative Project Planning World Bank Loan for 2014-2016 Fiscal Year*(2013.7) , which have listed Guizhou Tongren rural road project as an alternative project plan for 2014-2016 fiscal year. Guizhou Province Development and Reform Commission issued a file Guizhou Fagaiwaizi [2013] No. 2184 *Notice for Approval to the Proposal for the Project about Rural road in Tongren City of Guizhou Province by Using Work Bank Loan* (2013.8), which has approved the proposal. Tongren rural road project is mainly to improve the structure of rural roads and raise their living standards, which is an important measure to building a new socialist countryside and one of tangible things to serve for people by the municipal government.
2	Saving land, occupying less cultivated land and woodland as well as minimizing relocation; compensating for the necessary occupation and demolition timely in accordance with the relevant documents and resettlement program; requiring the relevant departments to open the land acquisition and resettlement program and doing a good job on village resettlement and compensation.	Saving land and occupying less cultivated land and woodland; construction unit should not only carry out a detailed investigation of land acquisition and resettlement, but also perform the land acquisition compensation standards in accordance with relevant provisions of the provincial government, and Tongren municipal party committee and government, furthermore, they should open the land acquisition and resettlement program, and resettle the villagers properly too to guarantee that their living standards would not be less than the current levels.	Further optimizing the route programs to protect farmland and forest resources and save land; carrying out a detailed investigation of land acquisition and resettlement, performing the land acquisition compensation standards in accordance with relevant provisions of the provincial government, Tongren municipal party committee and government and the actual local situation, and opening the land acquisition and resettlement program; adopting the way of resettlement for moving back on the spot and changing the homestead in the village to guarantee that their living standards would not be less than the current levels.
3	In the process of construction, paying more attention to the protection of the ecological environment, sound environment, water environment and	In the construction process, the construction unit should strengthen the environmental management, and strictly implement the environmental protection measures of the environmental impact assessment report, as well as "Three Simultaneous" system to	In the construction process, the construction unit should strengthen the environmental management, and strictly implement the environmental protection measures of the environmental impact assessment report, as well as "Three Simultaneous" system to minimize the environmental impact. In nature reserves and scenic spots, the scope of construction should be strictly controlled to protect the natural appearance, and soil

	atmospheric environment, besides, protecting the targets involved along the route in strict accordance with the requirements and measures proposed by the EIA; strengthening the efforts of afforestation and investment on water conservation along the route, especially on the unfavorable geology section; ensuring the project quality.	minimize the environmental impact. In nature reserves and scenic spots, they should strictly control the scope of construction to protect the natural appearance, rare and endangered wild animals and plants, as well as the water quality along the route, more than that, they should also strengthen the forest fire prevention. In addition, soil digging and discarding places and construction field should not be set in nature reserves and scenic spots. Road greening and landscape design should be done well, and the vegetation restoration should take native trees and grass species to confirm the coordination of road landscape with the surrounding natural environment. For landslide-prone areas, the next phase of design should be designed and constructed well to protect slope, with increasing the investment on water and soil conservation along the route, especially on the unfavorable geology section to ensure the project quality and avoid any harm to the protection targets along the village.	digging and discarding places and construction field should not be set in order to protect rare and endangered wild animals and plants, as well as the water quality along the route; keeping away from fire sources, strengthening forest fire management in protected areas, scenic areas and forest area to prohibit the construction personnel and management personnel from carrying kindling, and establishing forest resources management target responsibility system and emergency plan for forest fire. Road greening and landscape design should be done well, and the vegetation restoration should take native trees and grass species to confirm the coordination of road landscape with the surrounding natural environment. For landslide-prone areas, the next phase of design should be designed and constructed well to protect slope, with increasing the investment on water and soil conservation along the route, especially on the unfavorable geology section to ensure the project quality and avoid any harm to the protection targets along the village.

5.5 Conclusions of public participation

Through the statistics of questionnaire survey and forums with public participation, it can be found the support of the public for this engineering construction reaches 100% with no objection, which indicates the public agree this project. Moreover, no objection from any group or unit has been received during information publish period. Most villagers and cadres believe the implementation of this project will accelerate the development of regional transportation, bring great traffic convenience to regional villagers, drive the regional economic development, help poor villagers to overcome poverty and achieve prosperity. As this project can benefit the regional villagers, villagers all hope this engineering project can be implemented as early as possible. Therefore, it can be concluded that the local public positively support this engineering construction.

6 Environmental Management Plan

6.1 Purpose

The environmental impact assessment of this project indicates that the major environmental problems come from the vegetation deterioration in project areas, the noise produced by vehicles, the exhaust gas emission and waste water. This Environmental Management Plan will specifically explain contents on environmental mitigation measures, environmental management and environmental supervision. It will be the instructive document for implementing these activities and its functions are as below:

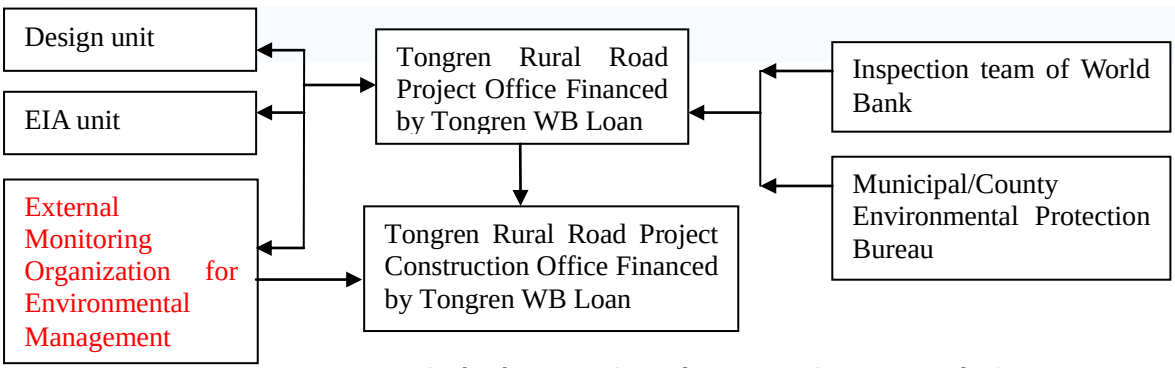
(1) Define the environmental mitigation measures for affected targets. The project construction office, environmental impact assessment unit and design unit will conduct detailed site verification and confirmation, and propose effective environmental mitigation measures to incorporate into the project design.

(2) Provide instructive document on environment. After the review of the World Bank, this Environmental Management Plan will be provided as environmental protection texts to construction supervision unit, environmental supervision unit and other relevant units at construction and operation stages.

(3) Specify the responsibilities and functions of relevant units. It will define the responsibilities and functions of relevant functional departments and management institution and propose communication channels and modes of various departments.

As this project has formulated independent *Environmental Management Plan*, the specific details can be referred to in *Environmental Management Plan*.

6.2 The composition and main responsibilities of environmental management institutions



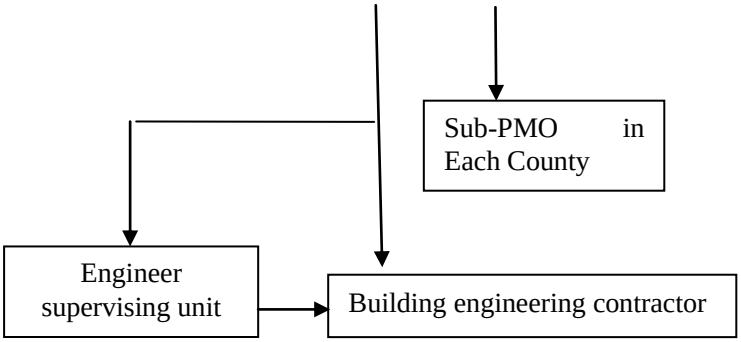


Figure 6.1-1 Diagram of environmental management system

Table 6.1-1 Table of the Composition and Main responsibilities of Environmental Management Institution

Institution Name	Institutional Mission	Main Responsibilities
Tongren Rural Road Project Office Financed by Tongren WB Loan	Responsible for overall project coordination and management	① Responsible for the procedure of the planning, design and environment protection of the project in coordination with the requirements of domestic and the world bank. ② Responsible for coordination, supervision, follow-up reports, and settlement of major environmental problems. ③ Responsible for hiring the EIA units and external monitoring organization for environmental management
Tongren Rural Road Project Construction Office Financed by Tongren WB Loan	Responsible for the implementation and management of each subproject.	①Responsible for the project design and a series of environmental protection and management work at preparation stage ②Responsible for the implementation of environmental protection funds. ③ Responsible for contacting and coordinating with Guiyang Traffic Project Office financed by the World Bank for the implementation of environmental management. ④Responsible for specifying the environmental executives to implement their own environmental protection practice and follow-up reports, and coordinate the contractor and supervisor to take action for environmental management, accept and handle complaints.
Sub-PMO in Each County	Responsible for the coordination of each subproject.	Responsible for the land acquisition, demolition and other work of the subproject.
Municipal/ County Environmental Protection Bureau	Government Administrative Supervision and Administration Department is responsible for the approvals of EIA of Construction Project.	Government administrative supervision and administration department is responsible for the approvals of EIA of Construction Project.
Construction Company (Contractor)	The implementing agency is responsible for implementing the related environmental measures required in ECOP.	Responsible for verifying the construction site and environment practice /environmental impact assessment report, implementing the environmental protection practice and protecting the environment quality before construction to ensure that the quality of the environment would not decrease because of the project construction.
Engineering Project Supervisor and Environmental Supervisor	Responsible for the site supervision, inspection and management of the emission condition of the pollution sources as well as the ecological damage incidents in the construction of the project according to law.	① Responsible for conducting the site environment inspection every week and filling in environmental protection checklist in construction period and filing. ② Responsible for putting forward rectification plan for the unqualified requirements of environmental protection practice and supervising its implementation.
EIA Advisory Unit	Responsible for the independent environmental impact assessment of the	Responsible for formulating the environmental practices and the domestic EIA documents.

	subproject, and the technical support for environmental protection engineering design as well as the formulation of environmental practice.	
Design Advisory Unit	Responsible for the feasibility research,initial design, construction drawing design and preparation of bid document.	①Responsible for ensuring the minimum impact of the engineering technology scheme on the environment. ②Responsible for incorporating all the environmental protection measures proposed in the feasibility study,initial design and project environmental impact assessment into the the design programme and budget, and then integrate them into the technical specifications of the tender.
External Monitoring Organization for Environmental Management	Responsible for assisting the Tongren Rural Road Project Construction Office Financed by Tongren WB Loan for preparing the EIA report and supervising the implementation of environmental protection during project execution.	①Responsible for carring out on-site supervision and verification for the implementation of environmental measures on a regular basis; ② strictly implementing the monitoring tasks in Table 6.3-1 monitoring plan; ③ Submitting an interim monitoring report to the world bank and the environmental management institutions about the environmental management for the current year amd seasons at the end of each year and season. ④ Submitting an annual monitoring report to the world bank and the owners of units before December 31 of each year. ⑤Submitting an integrated environmental management evaluation report when the the overall environmental management work have been fulfilled for half a year.

6.3 Environmental Monitoring Plan

Environmental monitoring plan is designed to monitor the implementation of the various measures, adjust the action plan for environmental protection timely accoriding to the monitoring results, and provide the basis for the implementing date and scheme of the environmental protection measures. The formulation is based on the expected major environmental impacts in various periods.

As this is rural road and bridge project, with small scale subprojects and limited environmental impacts, the environmental monitoring plan would be only for the individual subproject which is very sensitive to the environmental issues. According to the engineering characteristics of rural traffic, environment monitoring scheme would be designed by stages in accordance with construction period and operation period. The scheme is listed in Table 6.3-1.

Table 6.3-1 Environmental Monitoring Plan in Construction Period and Operation Period

Subproject No.	Name	Monitoring Site	Monitoring Content	Monitoring Frequency	
				Construction Period	Operation Period
I.Dejiang County					
1	Highway from Mingxi to Dongquan	100m downstream from Yazitou Bridge of the tributary of Liuchi River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Baopen Village Primary School	Noise	1	1
		Leichong Dam	TSP	1	1
6	Highway from Pingyuan to Nangan	Nangan River	pH, CODcr, NH_3-N,BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Tianjin Primary School	Noise	1	1
		Yejia Dam	TSP	1	1
		Gunanmu, Zeng Ancestral Hall	Management	1	-
9	Highway from Changfeng to Duoping, Lengshuijie bridge	Changfeng River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Duoping School	Noise	1	1
		Duoping	TSP	1	1
19	Highway from Hetou to Dayuan	Natural Culture Relic Stone Tiger	Management	1	1
		Xianba Primary School	Noise	1	1
		Xianba Village	TSP	1	1
43	Highway from Chaodi to Chenyuan	Wujiang River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Chendatuo	Noise	1	1
		Chendatuo	TSP	1	1
44	Highway from Wujia ditch to Xujia hill, Pianyan bridge, Guanyin bridge	Pianyan River——the tributary of Liuchi River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Mozi Rock	Noise	1	1
		Mozi Rock	TSP	1	1

48	Highway from Matixi to Meijia	Mati River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Meijia Hill	Noise	1	1
		Meijia Hill	TSP	1	1
II.Sinan County					
25	Qinglongju bridge	Xiaoxi River——the tributary of Longdijiang	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Longdijiang Scenic Spot	Management	1	1
72	Highway from Tangben to Shuanghe	Heitan River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		An'jia Dam	Noise	1	1
		An'jia Dam	TSP	1	1
77	Highway from from Lancaocha to Meizibao, Juanziwan bridge	Qingdu River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
79	Highway from Shangguanqing to Langan	Yangjia'ao—— the tributary of Longdijiang	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Siyetun Nature Reserve	Management	1	1
		Shangguanqing Group	Noise	1	1
		Shangguanqing Group	TSP	1	1
81	Highway from Liangshuijing to Guankou	the tributary of Yinjiang River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Moxi Primary School	Noise	1	1
		Lijiagou	TSP	1	1
84	Highway from Dongqing'ao to Dongjiawan	Wujiang River	pH, CODcr, NH_3-N, BOD_5, SS, Petroleum, Fecal Coliforms	1	1
		Yanjing Primary School	Noise	1	1
		Shangzhai	TSP	1	1

6.4 Environmental Supervision and Management Plan

After awarding building projects, working achievements like environmental influence evaluation of each conducted program (including environmental impact assessment report, environmental implementation plan, and the environmental management plan may be required in the future), and copies of local environmental EIA approval documents should be provided to the contractor in World Bank's Tongren Office before construction. The contractor is requested to take an

environmental research on the construction site, aiming at verifying and recognizing the environmental description about construction site in environmental impact evaluation of each conducted program and the environmental restrictive factors within project region. Meanwhile, it puts forward appropriate environmental prevention and mitigation measures with regard to the new environmental sensitive issues discovered on environmental investigation before construction. Construction is available after approved by Environmental Supervision. Project environmental supervision and management can be seen in Table 6.4-1.

Table 6.4-1 Summary Table of Project Environmental Supervision and Management

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
Design Stage				
1	Water and Soil Loss	Design apporopriate construction sequences and scientific construction methods, select appropriate materials, stock ground and spoil ground, and prevent for soil erosion;	Design Organization Evaluate Organization	Construction Office of Guizhou Tongren Rural Road Project Financed by the World Bank Loan, Project Supervision Agency
2	Afforest	Make afforestation design around buildings;		
3	Farmland Protection	Compensate for land acquisition of the project complying with relevant regulations and make sure funds are implemented to specific households;		
4	Air Pollution	Set stock ground and mixing plant 200 meters away the sensitive site;		
5	Slope Protection	Select suitable slope protection methods in accordance with its requirements and project characteristics.		
Construction Stage				
1	Land Resources and Ground Vegetations	(1) Optimize appropriately the layout of construction site and reduce construction activities range as far as possible as well as decrease the damages of constructon on vegetation; (2) Transport the outsourcing construction materials such as stones, sand and cement when acctually needed; reduce land occupations and vegetation damages; clear construction site in time after project completion and conduct greening on it so as to recover the damaged vegetaion at the most extent; (3)Set temporary protective fences around the trees that have not been cut or transplanted before construction on the basis of construction site verification. (4)No adding other marks on trees except for identification tags; no stacking or stocking of construction materials or parking mechanical equipment around tree protection zone; (5)Build temporary drainage ditches on construction site and construct flood dredging road for dameged surface runoff on this project, and lead the flood caused by rainy season away to avoid erosion of surface runoff to project; (6)The construction organization shall minimize the land occupation time and control ground work construction time, meanwhile, keep excavatting and filling slopes steadly and reduce the project's impact on environment outside of construction range on the premise of ensuring construction quality; (7)Strip and stockpile the topsoil of construction site, stock ground and borrow pits for deuteric land	Construction Organization	Construction Office of Guizhou Tongren Rural Road Project Financed by the World Bank Loan, and External Monitoring Organization for Environmental Management

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
		rehabilitation and revirescence.		
2	Water and Soil Loss	1. Subgrade Area (1)Topsoil stripping and protection; (2)Road shoulder water retaining ridge and temporary chute; (3)Sediment deposition measures. Set up sand basin on the exit of subgrade drain. 2. Concrete Mixing Plant (1)Harden all sites with cement; (2)Build a sand basin at each concrete mixing plant and utilize surface water within the site comprehensively after sedimentation on sand basin; (3)Land consolidation at the late of project, include dismantling construction facilities and clearing the building materials such as stones and sand thrown during concrete mixing; meanwhile, green or reclamate the land there for recovering its original appearance to the utmost extent. 3. Construction Road Set up construction road from existing roads as much as possible; select barren land a to build a new road if needed as it's prohibited to occupy forest land and basic farmland. Build construction roadside drainage ditches preventing for water and soil loss. 4. Temporary Spoil(Dregs) Ground (1) Attach importance on the location selection of spoil(dregs) ground; virescence or rehabilitation should be taken if the ground damages the original land vegetation or causes bare slope because of original surface gradient change . (2)Timely greening, soil covered reclamation or other comprehensive utilization are considerable after completion of spoil. (3)Reasonable dregs blocking and slope protection project of spoil ground should be set in light of the spoil's quality, its stack position and estimated stacking height, etc.; build dregs blocking dam when stack spoil in ditches. (4)Set up spoil ground drainage system in accordance with the ground's terrain, geology and hydrologic condition combining with facilities include channels, irrigation and so on for the purpose of avoiding water to wash away soil or change the surface runoff condition causing scour of farmland and slope. Water interception and drainage measures are utilizable to drain water out when there is confluence condition around spoil ground. In addition, use native species to recover the	Construction Organization	The Same as Above

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
		vegetaions of protevtive areas(include main construction, construction road and concrete mixing plant) and temporary spoil(dregs) ground after project completion in stead of exotic species.		
3	Surface Water Pollution	(1) All waster water produced from vehicles washing, building materials washing, concrete maintenance and aggregates washing on construction site shall be gathered and mixed diluted in water trough, and then be treated in temporary sedimentation basin; set the size of temporary sedimentation basin on the basis of ensuring waste water to stay at it more than 12 hours; all disposed waste water is used to construction site washing, building materials washing, concrete maintenance and aggregates rewashing. (2) Set temparary pit toilet on construction site; clean up the excrement regularly and utilize it as agricultural fertilizer in accordance with the actual living conditions of rural areas; (3) Enhance construction management and strictly control the mechanical equipment's oil spilling, emitting, dripping and leaking problems; apply good temporary drainage system and water conservation measures to prevent the soil and water loss of storaging spoil from affecting the water environment; (4) All construction units shall put various waste water treatment measures into practice, including construction waste water and sanitary sewage, and ensure these waste water be handled and treated well; (5) Strengthen the environmental education of constructors and improve their environmental awareness; constructors are not supposed to throw waste or pour sewage casually.	Construction Organization	The Same as Above
4	Construction Noise	(1) Select advanced and reliable low-noise equipment in equipment selection; (2) Construction time starts from 6:00 to 22:00, and it is not allowed to construct from 12:00 to 14:00. Meanwhile, restrict the construction at night; if it is necessary to construct at night, it shall get a certificate issued by construction administrative department and be approved by environmental conservative administrative department, and inform the residents around. (3) Arrange construction schedule apporopriately and avoid multi sets of strong-noise equipment to work at one construction site at the same time; speed up	Construction Organization	The Same as Above

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
		schedule and catch time during construction and shorten noise impact time to reduce the noise impact on workers as much as possible. (4) Take basic shock absorption, install seismic isolation bearing or cover with damping materials for those mechanical equipment that will produce large noises; (5) Vehicle transportation noises may have some impact on the environmental sensitive sites along the line. In this case the construction unit shall enhance the workers' environmental awareness and arrange construction time apporopriately on conditions of knowing local customs and living habits in time; consciously take speed limit and horn prohibition measures in environmental sensitive areas like residential areas on construction machineries include vehicles, so as to prevent and mitigate noise impact; (6) Place strong-noise produced mechanical equipment at the side of construction site (away from residential area); set noise reduction fences around the construction site that is less than 5 meters away the buidings such as dwellings and schools; (7)It is suggested that the construction unit makes reasonable personnel arrangement, reduces the operation time of strong-noise equipment operator and provides earmuffs to them for reducing the impact on them. (8) Make regularly effective maintenance and repair to all mechanical equipment and keep them in good condition to achieve the purpose of noise reduction and extension of equipment utilization; (9) Be strict in management of construction intensity, mechanical equipment, vehicle operators and operating procedures, etc.		
5	Atmospheric Pollution	(1) Take low-cost macadam roads as construction roads and watering regularly ro reduce dust raising; (2) Fine granular materials that piled up on construction site shall be airtight storaged or be covered; sprinkling water on the materials' surface according to their nature, which will effectively suppress dust; (3) Set up road blocking fences when irrigation ditch construction pass the environmental sensitive	Construction Organization	The Same as Above

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
		sites(regions); (4) Use airtight containers when clear and transport the construction wastes, and volley throwing is prohibited; make classified storage, timely clearance and dissolution to the waste in accordance with the relevant provisions of urban waste management; moderately watering in advance when clearing and transporting; (5) Strenghten transport vehicles management and cover with tarpaulins on those vehicles that are easy to produce dust in transportation; (6) Take spraying water dust-controlling measures in demolition work; clear all waste soil within 3 days after completion of demolition complying with relevant regulations of demolition work management; (7) Shielding and enclosing measures or spraying water dust-controlling measures shall be taken in the dust floating area of construction site; (8) Uniformly pile up and cover the construction earthworks; full loaded vehicles are inadvisable for avoiding sprinking because of transportation vibration; (9) Take cleaning vehicles measures at the exits of construction site and clean up the adherent soils of vehicles before they go out ; (10) Storage grounds of materials and large formworks, etc, must be flat and solid; (11) Spray water and clear construction site in time; (12) Set up main dust sources(including fine granular materials stockpile ground) on downwind direction and 300 meters away the environmental protective site accoding to the consideration of prevailing wind direction and surrounding envirenmental protective goals; (13) It is forbidden to burn all kinds of wastes; (14) Use construction equipment and vehicles on normal condition and ensure exhaust emission reaching the discharge standard.		
6	Construction Safety and Health	Construction unit has the responsibility of complying with all national and local safety requirements and other measures of avoiding accidents to ensure workers ' safety and health. (1) Ensure the integrity of all buildings on the	Construction Organization	The Same as Above

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
		construction site; temporary buildings shall be structurally safe and shall be able to properly resist the severe weather of local area; in addition, set appropriate lignting and isolate some of the dust and noises; (2) Construction units shall ensure providing satisfactory first aid. Construction site shall be equipped with suitable first-aid equipment; a written emergency handling procedure shall be equiped at remote sites until the patient be transferred to appropriate medical institutions; (3) For all new construction workers, conduct occupational health and safety training, introduce the basic working rules and habeas corpus rules of construction sites and how to prevent other employees from getting injured to them; (4) Hung correct signboards for dangerous area (such as power distribution room and compressor engine room), installations, materials, security measures and emergency exits, etc; (5) If a worker's hands and arms vibrate due to using hand tools or electrical tools or his whole body vibrate for sitting in or standing on a vibrating surface, control these situations through equipment selection, installing vibration damping pad or damping device and limitting exposure time; (6) Eliminate the risk of clamping when design machine to ensure that the mechanical projecting part will not harm human body under normal operating condition; (7) Place warning signs on all energized electronic equipment and wires; examine all wires, cables and hand electric tools to check if there is damaged or exposed wire and determine the maximum working voltage of hand tools according to the manufacturer's recommendation; take double insulation/ ground connection measure to all electrical equipment being used on humid (or possibly humid) environment; (8) Provide appropriate eyes protective equipment(such as welding goggles and/or masks) to all workers who participate in or assist welding operation;		

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
		(9) Install protective railings at the fragile edges (include a rod in the middle and toe-board); meanwhile, construction workers use fall preventive devices (including seat belts and distance limited lanyards); (10) Construction unit confirm and provide workers suitable personal protective equipment and should be able to adequately protect him worker , the other workers and the occasional visitors, and should not cause unnecessary inconvenience to the users; (11) Construction unit should establish a procedure and system of reporting and recording occupational accidents, diseases and dangerous accidents; (12) Conduct health education to the workers such as implementing information communication strategy and enhancing face to face consultation; in addition, encourage them to use preventing methods like mosquito repellent, clothes and mosquito nets to avoid insect bites and disease spread.		
7	Hazardous Wastes and Chemical Wastes	(1) Chemicals should be properly stored and labeled; (2) Hazardous articles' storage shall meet the storage certificate's requirements on storage types, datas and so on; (3) Use specilized container to collect grease and so on during maintenance of mechanical equipment; (4) Install tools and materials being used for absorption of chemical leakage, including anti-fouling emergency box/sand/saw grinding tools.	Construction Organization	The Same as Above
8	Others	(1) Compensate for the project's occupied land in accordance with the relevant requirements, no withholding nor misappropriating, and ensure the immediate interests of the affected people; (2) Take regular medical examinations to the workers and prevent for epidemics; (3)Stop construction immediately if any relic found during construction, and report the relevant situation to local cultural relics department; construction shall not be continued untill the cultural authorities finish relic identification and take necessary protective	Construction Organization	The Same as Above

Serial No.	Management Content	Mitigation Measures	Implementing Organization	Supervision Organization
		measures; (4) Set safety supervisor, obvious warning signs and night lights on construction site, and forbid pedestrians and livestocks to enter the construction area.		

During project construction, the task of environmental supervision is to check whether the environmental protection and preventive measures satisfy the requirements proposed by environmental implementation regulations. The environmental supervisor shall check the construction site at least once a week, fill checklist of environmental examination during construction period and keep on a file, issue environmental rectification notice on environmental problems in construction activities of construction unit to contractor, supervise the contractor to take corresponding rectification measures, and report the situation every half a year to the environmental personnel of rural road project construction office in Guiyang and specialists of World Bank. At the end of construction, the supervisor shall check the site environment again before the environmental protection acceptance, fill and file the checklist before the environmental protection acceptance. The working process of environmental supervision during construction period is as shown in figure 6.4-1.

6.5 Training plan

For the smooth and effective implementation of this project, it is necessary to implement training on environmental knowledge and skill to all staff, especially constructors. Except explaining the significance of the planned project and the implementation significance to all staff, we shall carry out trainings with different emphasis for staff of different posts and concrete training combined both domestic and foreign training methods based on the importance of different management levels and environmental protection posts. The environmental protection training and education shall include the following contents:

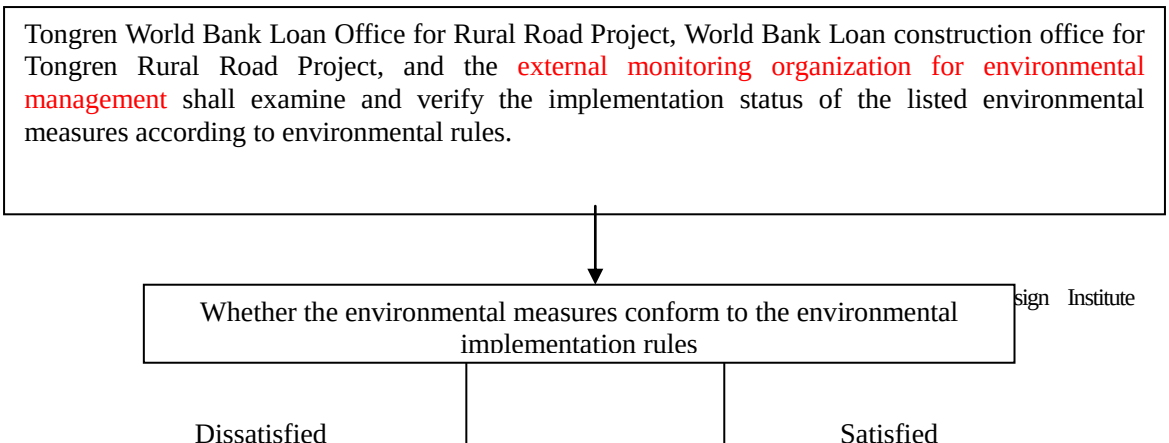


Figure 6.4-1 Working process of environmental supervision

(1) Before project start-up, the project organization shall designate special environmental specialist to conduct environmental protection training for building engineering contractor and construction control units.

(2) Before construction, the building engineering contractor shall implement educational training and assessment for operating personnel at construction sites, which shall include contents like laws and rules on environmental protection and environmental sanitation.

(3) The building engineering contractor shall conduct training on risk emergency plans to the staff annually and organize practice.

(4) The building engineering contractor shall conduct occupational health training and health examination for staff engaging in poisonous and harmful work, and instruct operating personnel to correctly use protective equipment against industrial disease and personal articles for labor protection.

The initial training plan can be viewed from Table 6.5-1.

Table 6.5-1 Training plan for environmental technicians

Personnel	Training contents	Means	Number of people	Time (days)
Construction environmental workers	Basic theory of environment, monitoring method, writing of monitoring report and post training.	Domestic training	2 people at each construction site	2
Environmental supervising engineer and environmental personnel of construction party	Environmental protection laws, construction plans, environmental monitoring norms and standards	Domestic training	1-2 people at each construction site and 2-4 people of construction party	2
	Ambient air monitor and control technology, and noise monitor and control technology	Domestic training	6	2
Senior environmental manager and engineer	Advanced foreign environmental management experience and noise control methods	Domestic training	4	1
Total				7

7 Appraisal and conclusion

In conclusion, “Tongren Rural Road Project Financed by the World Bank Loan” planned to implement this time obtains a total investment of 1,445,586 million, among them, 930 million (about 64.33%) is from the World Bank; 515,586 million (about 35.67%) is from the domestic funds. This project contains 86 rural roads, 30 bridges and capacity-building programmes. The construction of this project involves two comparatively backward counties: Dejiang and Sinan in the western region of Tongren city. Its construction would be a great significance in laying the foundation of poverty reduction and realizing the goal of constructing an affluent society in Dejiang and Sinan in 2020 at the same pace with the nationwide construction, playing a demonstrated and driving role at the same time, improving the balance between urban and rural development, enhancing the vitality of rural development, narrowing the developmental gap between the East and the West, the urban and the rural step by step, and speeding up the path of building a well-off society. This project is in line with state industrial policies and other related state and regional plannings. The site selection of the project areas does not involve drinking water protected areas or basic farmland protection zones, wild rare endangered species or ancient and rare trees involved, nor does it affect the local culture heritage. In the meantime, it can fully respect the folkways and customs of the local ethnic minorities. However, the construction of the roads also carries adverse influence in ecological environment, sound, gas and water environment along the line. Fortunately, the adverse influence is secondary, and the irreversible influence is tiny, most of which can be remitted and conquered through putting various environmental protection measures into practice. Therefore, this evaluation believes “Tongren Rural Road Project Financed by the World Bank Loan” is feasible in environment from the point of environmental protection as long as we comply with the relevant environmental policy required in the process of project implementation and production, and strictly execute the system of “Three Meantimes” at home to ensure that each solved measure of pollution and main parts of the project are designed, constructed, and put into operation at the same time. In this way, the adverse influence of the project can be minimized; the economic benefit, social benefit and environmental benefit can be unified organically; and the sustainable development in economy, society and environment can be achieved.