Environment Monitoring Report

Project Number: 35354-013
December 2016

PRC: Lanzhou - Chongqing Railway Development Project

Prepared by Beijing OASIS Environmental Protection Technology Co., Ltd.

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Asian Development Bank
Newly-built Lanzhou-Chongqing Railway Project by Asian Development Bank (ADB)

Environment Monitoring Report
(2016)

Beijing OASIS Environmental Protection Technology Co., Ltd.
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1. Foreword

1.1 Project Introduction

1.1.1 Route trend & major technological standards

Lanzhou-Chongqing Railway starts from Lanzhou hub of Lanzhou city, Gansu Province, goes through administration areas such as Dingxi and Longnan of Gansu, Hanzhong of Shaanxi, Guangyuan, Nanchong and Guang’an of Sichuan, and Hechuan District of Chongqing, and ends at Chongqing hub of Chongqing. A single-line railway section is introduced from Nanchong to Gaoxing via Guang’an. The railway line goes roughly in the south-north direction. A double-line railway, 819.975 km in total, shall be built between Lanzhou station and Station of North of Beibei. Of it, 491.437 km is for the section between Lanzhou and Guangyuan (not included) and 328.538 km for the section between Guangyuan (included) and Chongqing. The length of single-line railway between Nanchong and Gaoxing via Guang’an is 93.639 km.

The construction period of this project is 6 years and the estimated total investment for this project is RMB 78.9 billion Yuan, of which, 300 million US Dollars are the loan from Asian Development Bank.

The main technical standards for the main line of Lanzhou-Chongqing Railway:

<table>
<thead>
<tr>
<th>Grade of railway</th>
<th>State railway, grade I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of main lines</td>
<td>Double-line railway for the section between Lanzhou and Chongqing and single-line railway for the section between Nanchong East and Gaoxing;</td>
</tr>
<tr>
<td>Limiting Gradient</td>
<td>13‰ for the section between Lanzhou and Guangyuan; 6‰ for the section between Guangyuan and Chongqing and for the section between Nanchong East and Gaoxing;</td>
</tr>
<tr>
<td>Target speed</td>
<td>200 km /h for the section between Lanzhou and Chongqing and 160 km /h for the section between Nanchong East and Gaoxing;</td>
</tr>
<tr>
<td>Traction mode</td>
<td>Electric power</td>
</tr>
<tr>
<td>Traction mass</td>
<td>4000t</td>
</tr>
<tr>
<td>Minimum curvature radius</td>
<td>3500 m for ordinary railway section and 2000 m for the difficult railway section between Lanzhou and Chongqing 200 km /h; 2000 m for ordinary railway section and 1600 m for the difficult railway section between Nanchong East and Gaoxing;</td>
</tr>
<tr>
<td>Locomotive type</td>
<td>The section between Lanzhou and Chongqing: passenger train CRH, SS7E; cargo train SS7. The section between Nanchong East and Gaoxing: passenger train SS7E and cargo train SS7.</td>
</tr>
</tbody>
</table>

Effective Line from the Starting to the Destination: Single module: 850 m; dual module: 880 m

1.1.2 Main engineering content

- Total cubic meter of earth and stone for the whole line is $22880.5 \times 10^4 m^3$, $17776.82 \times 10^4 m^3$ for excavation, $5103.68 \times 10^4 m^3$ for filling; there are 433 Super-major bridges, major bridges and medium bridges with total length of 181788 linear meters of whole line; there are 267 tunnels, 596.8 km long wholly; there are 11 tunnels more than 10 km long with length of 168 km; the track laying of main track is 819.975 km, and that for hub and link lines is 180 km; 23 traction substations; the whole line covers land of 5218.2 hm², land of permanent use covers 3289.7 hm² and the land of temporary use covers 1928.5 hm².
- 42 new stations will be built and 15 stations will be modified along the whole line.
- Pavements 1445.1 km in length will be built.
- There are 324 sensitive points for noise and vibration treatment along the whole line. Besides functional
replacement is needed for 115 places, acoustic barriers (40310 m) or sound-insulating windows (83120 m²) will be arranged at 209 places. The total investment on noise treatment will be 202.433 million Yuan.

1.2 Characteristics of This Project

Lanzhou – Chongqing Railway goes through, from the north to the south, such three geomorphic units as Loess Plateau, high and medium mountains of the Qinling Mountains and low mountains and hills area in Sichuan Basin and spans such four climate zones as the arid climate area in the mid-temperate zone of Loess Plateau, sub-humid climate zone of mid-temperate zone, North Asia tropical humid zone in the high and medium mountains in the Qinling Mountains and Middle Asia tropical humid zone in Sichuan Basin.

Along Lanzhou-Chongqing Railway, there are many kinds of vegetation. The horizontal and vertical distribution of vegetation is obvious. Roughly, Qinling Mountains is taken as the dividing line. The biodiversity in Yangtze River Basin on the south of Qinling Mountains is higher than that in the Yellow River basin. The land erosion area in the drainage area of the Yellow River basin, in which the railway goes, is big, and the erosion extent is mainly medium, but it is serious or extra serious for some sections. The erosion variety takes the water conservancy erosion as the main and such gravity erosions as mud-stone flow and landslide etc. often occur in the earth and stone and mountain area. The ecological environment along the line sections in the drainage area of the Yangtze River is comparatively better, and, basically no obvious erosion or only light erosion can be seen for soil erosion.

Along the line, there are rich resources of wildings as well as cultural relics, which are mainly distributed in the natural reservation zones, the famous scenery spots and historical relics, forest parks, important marshes and the cultural relic protection zones and are greatly affected by the human activities. Emphasized protection targets: Ancient Xiaguanying relic, ancient Shannashuzha relic, Yuhe Natural Reserve of Gansu Province, Sichuan Maozhat Natural Reserve, Wetlands Natural Reserve of Jialing River Source, Myxiocyprinus Asiaticus of Natural Reserve, etc.; Ecological environmental protection main targets: cultural heritage, the vegetation, rare animal and land resources, etc. along the line. It is the important contents for environment monitoring work to strictly implement the relevant state laws and regulations, abide by the requirements and replies from the relevant state and local departments as well as various levels of departments for cultural relics, water conservation, forestry, environmental protection and fishing administration etc. and strictly execute the various measures in the EIA (environmental impact assessment) report during the construction.

The big rivers spanned by the railway line are the Yellow River, the Wei River, the Tao River, the Bailong River, the Jialing River, the Fu River and the Qu River etc. Since high subgrads will be replaced by bridges for this project, there is much bridge construction engineering for the whole line. The land occupation and disposed earth from the sub-grade for non-river-crossing bridges has certain impact on the ecological environment along the line, so has the construction of river-crossing bridges on the water quality and hydro bios of rivers.

The total volume of the cubic meter of earth and stone along this line is large and the volume of disposed earth is far bigger than the volume of taken earth, so it is vitally important to further optimize the allotment of cubic meter of earth and stone, reduce the earth-taking and earth-disposing volumes and occupied land areas, take such preventive measures as land reclamation and afforestation etc. in accordance with the land reclamation program and design for temporary land use and prevent the generation of new land erosion.

1.3 Environment Monitoring

The environment monitoring is to supervise and inspect the execution of environmental protection measures during construction of the project on the basis of the design and environment evaluation report of this project and to affirm the achievements, find out existing problems and give suggestions on countermeasures. The environment monitoring is to ensure the execution of the “simultaneous design, simultaneous construction and simultaneous construction” system by means of intensifying process control. It reflects the dynamic implementation status of environmental protection work on the construction site during the construction activities so as to confirm whether the relevant rules and regulations for environmental protection have been satisfied and whether the requirements from Ministry of Railways and Asian Development Bank have been met. Key points that attention should be paid to during environment monitoring include:

- Whether the environmental impact during construction is consistent with the environmental problem put forward in the environmental impact evaluation report;
- The accomplishment of environmental protection measures given in environmental impact evaluation report;
- Identify and find out any unpredicted environmental problems and put forward recommended solutions;
The environmental monitoring of Lanzhou-Chongqing Railway is taken by Beijing OASIS Environmental Protection Technology Co., Ltd. The service range is the main line of Lanzhou-Chongqing Railway from Lanzhou to North Beibei, which is 818.71 km long in total. The cycle of environment monitoring work is the construction period of the whole line and within the two years after being put into operation after completion. For every half year of the construction period and for every year of the two years after completion, one environment monitoring report (in both English and Chinese) should be prepared by OASIS Company on the basis of the on-site survey and collected monitored data and submitted to Materials Department of China Railway Corporation, Lanzhou-Chongqing Railway Co., Ltd., Development Planning Department of the Ministry of Railways and Asian Development Bank.

The monitoring report should contain the following content:

- Impacts on the ecological environment imposed by construction of stations, tunnels, bridges and subgrade inside key ecological environmental protection zones such as natural preservation zones, scenic spots, forest park and ancient cultural relics etc. as well as the recovery and treatment measures;
- Impacts of arrangement, protection, reclamation and afforestation measures for the spoil ground on the water and soil conservation facilities, disturbance imposed by construction to vegetation and recovery and treatment measures;
- Impacts of tunnel construction on ambient environment and implementation status of protective measures;
- Impacts on the surface water body from the bridge construction and the implementation status of preventive measures;
- The implementation and effect of the protective measures of subgrade slope.
- Impact and prevention of noise, sewage water, dust and solid waste created in the construction camps, on the pavements, girder fabrication yards and laying and erecting foundation on the temporary engineering sites and recovery measures of land for temporary use.
- Implementation status of various environment protection measures adopted for the project (including the noise prevention engineering, sewage treatment and electromagnetism, etc.).
- Propaganda on sanitation in the construction camp and health of construction personnel.

2. Brief of Engineering

2.1 Project Construction Unit, Constructor and Supervision Unit of Lanzhou-Chongqing Railway

The project implementation unit of Lanzhou-Chongqing Railway is Lanzhou-Chongqing Railway Co., Ltd. There are 16 bid sections, 19 constructors and 13 supervision units along the whole line. Table 2-1 lists the constructors and supervision units for each bid section.

<table>
<thead>
<tr>
<th>No.</th>
<th>Section</th>
<th>Constructor</th>
<th>Supervision unit</th>
<th>Construction mileage</th>
<th>Length of bid section (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LYS-1</td>
<td>China Railway No.10 Engineering Group Co., Ltd.</td>
<td>Engineering Consultancy &amp; Supervision Co., Ltd. of FSDI.</td>
<td>DK30+000-DK103+150</td>
<td>73.14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>China Railway 19th Bureau Group Co., Ltd.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>LYS-2</td>
<td>China Railway 16th Bureau Group Co., Ltd.</td>
<td>Gansu Tieke Construction Supervision Co., Ltd.</td>
<td>DK103+150-DK173+200</td>
<td>69.96</td>
</tr>
<tr>
<td>3</td>
<td>LYS-3</td>
<td>China Railway Tunnel Group</td>
<td>Beijing Tiecheng Construction Supervision</td>
<td>DK173+200-DK259+510</td>
<td>83.74</td>
</tr>
</tbody>
</table>
### 2.2 Engineering Progress

The construction kickoff meeting for this railway line was held on Sep. 26, 2008, on which the construction of this project starts officially. In Oct. 2008, construction of 28 km-long Xiqinling Tunnel started, which is the control 

<table>
<thead>
<tr>
<th>No.</th>
<th>Section</th>
<th>Division</th>
<th>Construction &amp; Supervision</th>
<th>Mileage</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>LYS-4</td>
<td>China Railway No.7 Engineering Group Co., Ltd.</td>
<td>Beijing Tieyan Construction Supervision Co., Ltd.</td>
<td>DK259+510-DK352+759</td>
<td>93.65</td>
</tr>
<tr>
<td>5</td>
<td>LYS-5</td>
<td>CCCC Second Highway Engineering Co., Ltd.</td>
<td>Supervision Company of Lanzhou Jiaotong University;</td>
<td>DK352+759-DK391+800</td>
<td>33.45</td>
</tr>
<tr>
<td>6</td>
<td>XQLS1</td>
<td>China Railway 18th Bureau Group Co., Ltd.</td>
<td>Sichuan Tieke Construction Supervision Company</td>
<td>DK391+800-DK423+915 (right line)</td>
<td>32.11</td>
</tr>
<tr>
<td>7</td>
<td>XQLS2</td>
<td>China Railway Tunnel Group</td>
<td>Sichuan Tieke Construction Supervision Company</td>
<td>DK391+800-DK423+915 (left line)</td>
<td>32.11</td>
</tr>
<tr>
<td>8</td>
<td>LYS-6</td>
<td>CCCC First Harbor Engineering Co., Ltd.</td>
<td>Inner Mongolia QinYuan Engineering Consultancy Co., Ltd</td>
<td>DK423+915-DK501+005</td>
<td>76.94</td>
</tr>
<tr>
<td>9</td>
<td>LYS-7</td>
<td>China Railway 21st Bureau Group Co., Ltd.</td>
<td>Gansu Xinda Construction Supervision Co., Ltd.</td>
<td>DK000+000-DK30+000</td>
<td>29</td>
</tr>
<tr>
<td>10</td>
<td>LYS-8</td>
<td>China National Coal Group Corporation</td>
<td>Zhengzhou Zhongyuan Construction Supervision Co., Ltd.</td>
<td>DK569+385-DK577+450</td>
<td>8.065</td>
</tr>
<tr>
<td>11</td>
<td>LYS-9</td>
<td>China Railway 18th Bureau Group Co., Ltd.</td>
<td>Zhengzhou Zhongyuan Construction Supervision Co., Ltd.</td>
<td>DK606+710-DK615+725</td>
<td>9.015</td>
</tr>
<tr>
<td>12</td>
<td>LYS-10</td>
<td>China Railway No.2 Engineering Group Co., Ltd.</td>
<td>China Railway Eryuan Engineering Consultancy &amp; Supervision Co., Ltd.</td>
<td>DK615+725-DK647+300</td>
<td>31.575</td>
</tr>
<tr>
<td>13</td>
<td>LYS-11</td>
<td>Road and bridge international Co., Ltd.</td>
<td>Beijing Fangda Construction Supervision Co., Ltd.</td>
<td>DK647+300-DK754+000</td>
<td>105.617</td>
</tr>
<tr>
<td>14</td>
<td>LYS-12</td>
<td>China First Highway Engineering Co., Ltd.</td>
<td>Beijing Fangda Construction Supervision Co., Ltd.</td>
<td>DK754+000-DK881+400</td>
<td>108.354</td>
</tr>
<tr>
<td>15</td>
<td>LYS-13</td>
<td>China Railway No.1 Engineering Group Co., Ltd.</td>
<td>Henan Changcheng Construction Supervision Co., Ltd.</td>
<td>ID2K770+955.51-ID2K860+092</td>
<td>Not within the monitoring range</td>
</tr>
<tr>
<td>16</td>
<td>LYS-14</td>
<td>China Railway No.10 Engineering Group Co., Ltd.</td>
<td>Beijing Tiecheng Construction Supervision Co., Ltd.</td>
<td>DK881+400-DK952+110.299</td>
<td>70.713</td>
</tr>
</tbody>
</table>
project of the whole line; in Mar. 2009, Xiaguanying-Guangyuan section started for construction; in Jul. 2009, the bidding documents for Guangyuan-Chongqing section were opened and the constructors concerned arrived at the site; in Sep. 2009, work began in succession in all construction and supervision bid sections. By far, Gaoxing branch line has been completed, Weituo-Chongqing section was opened on Dec. 30, 2014; Guangyuan-Weituo section of Lanzhou-Chongqing Railway was opened on Dec. 30, 2015. On Jun. 28, 2016, Lanzhou East Station to Xiaguanying section was opened. On Dec. 26, 2016, Guangyuan-Minxian section was opened. At present, the main project of Lanzhou-Chongqing Railway in 2016 is the construction of Humaling Tunnel and Muzhailing Tunnel, and the remaining track-laying works for a few tunnels were not through.

In view of the residual engineering workload of Lanzhou-Chongqing Railway is not large and has little impact on the surrounding environment. Therefore, the environment monitoring reports of 2015 and 2016 will be reported to ADB, China Railway Corporation and the Lanzhou-Chongqing Railway Co., Ltd. in the form of annual reports.

This report is based on the static acceptance report of Guangyuan-Minxian section which was opened at the end of 2016, with emphasis on the implementation of environmental protection measures.

This report is written by: Bai Xiaojun, Zhou Yang

3. Environmental Management

3.1 Environmental Management System

As the implementation unit of this railway line, Lanzhou-Chongqing Railway Co., Ltd. is responsible for the environmental protection of this line. The Environmental Protection Bureaus of Gansu (Lanzhou, Dingxi and Longnan cities), Shaanxi (Hanzhong city), Sichuan (Guangyuan, Nanchong and Guang’an cities) and Chongqing (Hechuan District) are responsible for supervision and management of environmental protection in their respective jurisdiction regions.

Environmental monitoring for main line of Lanzhou-Chongqing Railway shall be undertaken by Beijing OASIS. The constructors and supervision units are responsible for daily monitoring and supervision during construction. The construction unit and OASIS are responsible for collection of monitoring data, and then OASIS shall compile the environmental monitoring report and submit it to China Railway Corporation and Asian Development Bank. The environment monitoring procedures for this railway line are shown in block diagram 3-1.

According to the characteristics of this project and frequent environmental problems in the construction, the monitoring unit advises to conduct the environmental protection and management from the following aspects:

Advise the project management department of each bid section to have the full-time (part-time) worker for environmental protection. They need the pre-posting training of environmental protection, take charge of supervising and managing the environmental problem during construction process, and assist environmental administrative department to do well the environmental protection work.
Lanzhou-Chongqing Railway Co., Ltd.: As the constructor, entrusts the supervision unit to complete the monitoring work, including signing the relevant environmental protection contracts with the constructors and supervision units when awarding the contracts of project.

Constructor: Execute the project and complete the environmental protection work according to the requirements of contract.

Supervision unit: It supervises the engineering quality and environmental protection processing according to contractual requirements.

Environmental monitoring unit: As an external monitoring unit, it evaluates the implementation of environmental engineering and submits the monitoring reports to Lanzhou-Chongqing Railway Co., Ltd., China Railway Corporation and Asia Development Bank.

- Each constructor is advised to perform the corresponding promise of environmental protection in construction contract. Formulate corresponding measures for environmental protection pursuant to the environmental protection requirements specified in the design document, protect the environment of construction site, and avoid and reduce environmental pollution or damage due to improper methods of construction. Upon occurrence of environmental damage, adopt measures actively for treatment, and invite relevant experts and units immediately for solution if independent solution is not available.

- The supervision unit is required to be responsible for daily environmental monitor work in accordance with the environmental protection requirements under the construction contract. Once an environmental problem occurs during the construction, it should supervise and urge its timely solution and include the environmental protection into the engineering quality supervision system.

3.2 Environment Management of Lanzhou-Chongqing Railway Co., Ltd. in 2016

I. The environmental management of sections which have been opened in operation period

After the completion of Lanzhou-Chongqing railway sections, the Lanzhou-Chongqing Railway Co., Ltd. will entrust the operations management to Chengdu Railway Bureau and Lanzhou Railway Bureau for unified management in accordance with the principle of territory. Chengdu Railway Bureau and Lanzhou Railway Bureau have a complete environment management system and will manage the environmental protection work of the whole railway bureau. The environmental protection and energy saving and emission reduction work of Chengdu Railway Bureau and Lanzhou Railway Bureau is in the charge of the chief engineer and the leadership of railway bureau and they specifically set up the Energy Conservation and Environmental Protection Office (Section) under the Planning and Statistics Department, with full-time management staffs who are responsible for daily environmental monitoring work in environmental monitoring agency set up in the railway bureau.

II. Static acceptance of environment and water conservation projects

The working group for the professional static acceptance of environment and water conservation work in Guangyuan-Minxian section that composed by Lanzhou Railway Bureau and Lanzhou-Chongqing Railway Co., Ltd. has carried on the static preliminary inspection on Aug. 23 to 25, 2016 and the static re-inspection on Oct. 19 to 20, 2016.

III. The static acceptance conclusion:

The project of Guangyuan-Minxian section has basically implemented the environmental impact report and comments on environmental assessment and environmental protection measures in design documents; Soil and water conservation programs and approval comments and water conservation measures involved in design documents has been basically implemented with obvious protective effect. The environment and water conservation projects have passed the static acceptance inspection, and the next step could be carried out according to the procedures.

4. Supervision and Inspection of Influential Point

4.1 Investigation Situation of Ecological Protection and Soil and Water Conservation Measures

The main soil and water conservation measures of the project include: subgrade slope protection and landscape engineering and drainage engineering; station protection project; tunnel front slope protection project; The soil and water conservation measures of the temporary works mainly include the restoration measures of the temporary works such as borrow pit, spoil ground, girder fabrication yard, mixing station, track-laying base and the pavements. The investigation situation of ecological protection and soil and water conservation measures of the whole project is as follows:

(1) Borrow pit

The environmental assessment period within the range of acceptance set up a total of three borrow pits which cover 545 Mu and spread over the Loess Plateau area, borrow pits in Loess Plateau are mainly distributed in terrain flat land which is 200m away from both sides of the line.

According to the field investigation, there are 7 borrow pits in the scope of acceptance with the type of wasteland and dry land, covering an area of 249 Mu and the volume of taken earth is 119.4×10^4 m³. It has been restored and the transfer formality has been done at present.

(2) Spoil (Disposal) Ground

There were total 94 spoil grounds in the scope of acceptance in the environmental assessment period with the type of wasteland and dry land, covering an area of 8005.05 Mu and the volume of disposed earth is 4856.6×10^4 m³.

According to the field investigation, there are 114 spoil grounds in the acceptance area covering an area of 4540.96 Mu, and the volume of disposed earth is 3212.2×10^4 m³.

At present, all the spoil grounds have been restored and has completed the handover procedures, but survival rate of the green vegetation is not high in 11 spoil grounds such as the Sitougou spoil ground. It is necessary to strengthen plant protection measures, and improve the afforestation according to the design and make greening replanting in the 11 spoil grounds with low survival rate of green vegetation.

(3) Girder fabrication yard
There are 2 girder fabrication yards in this section with Wudu girder fabrication yard covering 141 Mu and Yangmu girder fabrication yard covering 68 Mu.

Wudu girder fabrication yard is the urban development land and now has been handed over to the local government; Yangmu girder fabrication yard occupied the railway territory and now the equipment has been dismantled.

(4) Mixing station

There are 58 mixing stations being set up in the construction process of Minxian-Yangmu section covering an area of 770.4 Mu.

According to the field investigation, there are 42 mixing stations which have been restored and have completed the handover procedures among the 58 mixing stations; the remaining 16 mixing stations are being reclaimed, a small amount of equipment has not been dismantled. It requires these 16 mixing stations to complete dismantling equipment, reclamation and handover procedures as soon as possible after use.

(5) Track-laying base

There are 2 track-laying bases in Minxian-Yangmu section including Yaodu track-laying base and Yangmu track-laying base covering an area of 175.4 Mu. The 2 track-laying bases all occupied the railway territory and now the equipment has been dismantled.

(6) Construction camp and pavement

The length of pavement in this project is 85 km, covering an area of 641.4 Mu; temporary camp covers an area of 1313.3 Mu; according to the field investigation, the pavements and a part of temporary camps are being reclaimed.

(7) Subgrade slope greening

Subgrade slope protection, intercepting and drainage ditch, drainage ditches on both sides of the subgrade were completed, the subgrade slope project slope protection completed the masonry and concrete volume of 56,400 m³, the subgrade drainage facilities completed the concrete volume of 4,800 m³; subgrade slope greening has planted shrub with the quantity of 1938.3 thousand. According to the field investigation, the subgrade slope protection, greening and the overall intercepting and drainage facilities have became a perfect system, and its protective effect and construction quality meet the requirements of water and soil conservation.

(8) Station protection project

The slope protection and drainage facilities of station subgrade project have been all completed; subgrade slope greening has planted shrub with the quantity of 544.1 thousand and grass with the quantity of 43.32 Mu.

(9) Tunnel front slope protection project

The tunnel front slope greening and intercepting and drainage protection project have completed an area of 9282 m² and completed 100% work of the construction drawing.

4.2 Implementation of Pollution Control Measures

4.2.1 Noise

1) Noise-barrier

EIA report requires to set up 4 noise-barriers of 2490 linear meters or 6835.5 m².

Due to alignment adjustment or sensitive protection target removal in construction stage, there are 20 noise-barriers of 8350 linear meters or 20117.8 m² in the scope of acceptance of the construction drawing. 2 noise-barriers in EIA stage have been canceled (because of line around to avoid) and 18 noise-barriers have been added (new added sensitive points in rerouted section).

According to the field investigation, the 20 noise-barriers designed in construction drawing have been implemented.
2) Acoustic window

EIA report requires to set up acoustic windows of 9530 m².

There are 6450 m² of acoustic windows in construction drawing which have not been implemented at present.

Rectification opinions: after the operation, it shall be implemented according to the monitoring results.

3) Function replacement

EIA approval requires to replace acoustic environment sensitive targets within 30 m away from center line of the railway’s outer rail with the function of housing or gradually move out through combining with land acquisition and urban planning.

According to the field investigation, the demolition of residential housing within 30 m away from the project boundary of Minxian-Yangmu has been completed with a total of 1584 households covering an area of 1,846,160m², the remaining 28 households about 3868 m² has not carried out function replacement and demolition.

Residential building that has not carried out function replacement and demolition should be used to replace the function or gradually move out combined with the urban planning.

4.2.2 Vibration

According to the field investigation, the demolition of residential housing within 30 m away from the project boundary of Minxian-Yangmu has been completed with a total of 1584 households covering an area of 1,846,160m², the remaining 28 households about 3868 m² has not carried out function replacement and demolition (function replacement measures of noise suggested apply).

Residential building that has not carried out function replacement and demolition should be used to replace the function or gradually move out combined with the urban planning.

4.2.3 Electromagnetic protection measures

EIA report puts forward that the distance from traction substation to the residential area is much larger than 20m, power frequency magnetic field that generated by traction substation will not has a harmful effect on nearby resident.

According to the field investigation, there are 23 residences existing within the scope of 20m outside the wall in the new-built eight traction substation including Hadapu station, Shawan, Ganju and Yaodu traction substation.

EIA report regards the distance that is 20m outside the wall from the traction substation shall be regarded as the control distance. According to the acceptance electromagnetism monitoring results, in the next stage, the relocation measures will be taken for the original residential houses with excessive electromagnetic energy.

4.2.4 Sewage Treatment Measures

There are 10 stations discharge sewage along the road, construction design: the domestic sewage from Minxian, Shawan, Ganju station (Toufang station) and Fengxiangyuan station (Luotanghe) discharges into nearby ditches after treatment by sewage land treatment system; sewage from Hadapu station discharges into nearby ditches after treatment by oil separator and SBR sewage treatment equipment; sewage from Linjiangpu station (Dangchang) discharges into nearby ditches after treatment by SBR sewage treatment equipment; sewage from Liangshui (Longnan West Station), Longnan station access to municipal pipe after treatment by septic tank; sewage from Yaodu station shall be used for greening after treatment by SBR sewage treatment station; domestic sewage from Yangmu station discharges into nearby ditches after treatment by SBR sewage treatment station.

According to the field investigation, the sewage treatment systems of 10 stations within the scope of acceptance have been completed in line with design and construction.

4.2.5 Atmosphere
The coal-fired boiler has been newly added into the section of acceptance scope project in EIA stage, chimney height of boiler room shall not be less than 20 m.

According to the field inspection, heating equipment of Linjiangpu station and Shawan station in the scope of acceptance is air source heat pump; Minxian and Hadapu station is oil burning boiler; Liangshui (Longnan West Station) and Longnan station access the municipal heat source. The facilities have been installed at present.

4.2.6 Solid Waste

EIA report puts forward: garbage from passenger train shall be sent to designated stations, and garbage collection and transportation devices shall be provided in station platform. After collection, the garbage shall be hand over to the sanitation department for centralized treatment.

Field investigation: garbage from passenger train and household garbage of station staff shall be designated collected and be unified removed. After being equipped with trash collection in station and waiting room, the garbage shall be unified treated by local sanitation department.

In brief, the environmental protection and water conservation measures have been basically implemented. As for the existing problems, the problem library and rectification measures and completion time have been provided in the static acceptance report and have been signed to confirm by Lanzhou Railway Bureau, Lanzhou-Chongqing Railway Co., Ltd., design unit FSDI, project constructor, project supervision unit, the environmental protection acceptance unit China Railway Fifth Survey and Design Institute Group Co., Ltd, water conservation monitoring unit Gansu Lvhua Ecological Company and so on.
5. Photos

Photo 1  Slope and retaining wall of spoil ground  
Photo 2  Greening of spoil ground

Photo 3  Retaining and recovery of spoil ground  
Photo 4  Place of mixing station has recovered

Photo 5  Protection of Subgrade Slope  
Photo 6  Greening of front slope along tunnel

Photo 7  Sound barrier of beam

Photo 8  Noise-barrier of subgrade

Photo 9  Sewage land treatment system

Photo 10  SBR sewage treatment system

Photo 11  Air source heat pump

Photo 12  Oil burning boiler