A New Highway Project of Ailing (Jiangxi and Fujian Border)-Ruijin Section of Xiamen-Chengdu Expressway in Jiangxi Province

Environmental Management Plan

(First version)

Jiangxi Provincial Communication Department
World Bank Loan Project Office

September 2005
CONTENTS

1 Forewords ................................................................................................................................. - 1 -
  1.1 Overview ............................................................................................................................... - 1 -
  1.2 Compilation basis ................................................................................................................ - 1 -

2 Environmental impact assessment conclusions ................................................................. - 4 -
  2.1 Ecological environment ...................................................................................................... - 4 -
  2.2 Water environment ............................................................................................................. - 4 -
  2.3 Acoustic environment ....................................................................................................... - 5 -
  2.4 Ambient air ........................................................................................................................ - 7 -
  2.5 Social environment .......................................................................................................... - 7 -
  2.6 Pollution risk of transportation ........................................................................................ - 8 -
  2.7 Alternative schemes .......................................................................................................... - 8 -
  2.8 Profit/loss analysis of environmental economy .............................................................. - 9 -
  2.9 Environmental protection, management and monitoring plans .................................... - 9 -
  2.10 Public participation ......................................................................................................... - 9 -
  2.11 Comprehensive assessment conclusion ........................................................................ - 10 -

3 Mitigation measures for Environmental impacts ............................................................... - 11 -
  3.1 Mitigation measures for ecological environmental impact .......................................... - 11 -
  3.2 Mitigation measures for water environmental impact ..................................................... - 14 -
  3.3 Mitigation measures for acoustic environmental impact ................................................ - 17 -
  3.4 Mitigation measures for ambient air impact ...................................................................... - 26 -
  3.5 Mitigation measures for social environmental impact .................................................... - 27 -
  3.6 Hazardous cargo transportation management and prevention measures .................. - 29 -
  3.7 Environmental protection measures for roadbuilding materials and transportation .................................................. - 34 -

4 Executing organization for environmental management and its duties ............................. - 35 -
  4.1 Executing organization for environmental management .................................................. - 35 -
  4.2 Environmental management plan .................................................................................... - 36 -
  4.3 Supervising organization .................................................................................................. - 47 -

5 Environmental monitoring plan and environmental standard threshold value .................. - 50 -
  5.1 Environmental monitoring plan ....................................................................................... - 50 -
  5.2 Environmental standard threshold value .......................................................................... - 51 -

6 Ability development and environmental protection training ............................................. - 54 -

7 Implementation progress and cost estimation ..................................................................... - 56 -
  7.1 Implementation progress for environmental protection measures ............................... - 56 -
  7.2 Investment budget for environmental protection .............................................................. - 56 -
1 Forewords

1.1 Overview

The 《Environmental Management Plan for A New Highway Project of Ailing (Jiangxi and Fujian Border)-Ruijin Section of Xiamen-Chengdu Expressway in Jiangxi Province》(first version) is based on the 《Environmental Impact Assessment Report for A New Highway Project of Ailing (Jiangxi and Fujian Border)-Ruijin Section of Xiamen-Chengdu Expressway in Jiangxi Province》 (first version). The mitigation measures, monitoring and training plans proposed in this report have been preliminarily discussed with the design institute, construction unit, immigration and resettlement office and environmental management department, but are subject to further adjustment according to any variations in the engineering design.

Jiangxi Provincial Communication Department is responsible for organizing the implementation of environmental management plan for A New Highway Project of Ailing (Jiangxi and Fujian Border)-Ruijin Section of Xiamen-Chengdu Expressway in Jiangxi Province. Jiangxi Provincial Expressway Administration and Jiangxi Provincial Communication Department World Bank Loan Project Office are responsible for the implementation of environmental measures for this project during design, construction and operation stages.

1.2 Compilation basis

1.2.1 National laws, regulations and technical specifications

(1) 《People's Republic of China Law on Environmental Protection》;
(2) 《People's Republic of China Law on Environmental Impact Assessment》;
(3) 《People's Republic of China Law on Prevention and Control of Ambient Noise Pollution》;
(4) 《People's Republic of China Law on the Prevention and Treatment of Water Pollution》;
(5) 《People's Republic of China Law on Air Pollution Prevention》;
(6) 《People's Republic of China Law on Solid Waste Pollution Prevention》;
(7) 《People's Republic of China Law on Water and Soil Conservation》;
(8) 《People's Republic of China Law on Land Management》;
(9) 《People's Republic of China Law on Flood Control》;
(10) 《People's Republic of China Law on Fishery》;
(11) 《People's Republic of China Law on Agriculture》;
(12) 《People's Republic of China Law on Wild Animal Protection》;
(13) 《People's Republic of China Law on Cultural Relics Protection》;
(14) 《People's Republic of China Law on Road》;
(15) 《Implementing Regulations of People's Republic of China Law on Land Management》;
(16) 《Implementing Regulations of People's Republic of China Law on Water and Soil Conservation》;
(17) 《Environmental Protection Management Rules of Construction Project》（State Council Ordinance No. 253）;
(18) 《Environmental Protection Classification Management Register for Construction Project》;
(19) 《Regulations of Basic Farmland Protection》（State Council Ordinance No. 257）;
(20) 《Environmental Protection Management Method of Road Construction Project》;
(21) 《Registar Namelist of Wildlife under Special State Protection》;
(23) 《Urgent Notice on Forbidding Occupying Basic Farmland for Planting Issued by State Council》（state [2004]No 1, 2004.3）;
(24) 《Notice on Most Rigid Implementing Cultivated Land Protection in Road Construction》
（issued by the Ministry of Communications [2004]No. 164, 2004.4）;
(26) 《Environmental Protection Management Regulations for Construction Project in Jiangxi Province》 [Jiangxi Provincial People’s Congress Order No. 96, 2001.6];
(27) 《Environmental Pollution Prevention Regulations in Jiangxi Province》 [Jiangxi Provincial People’s Congress Order No. 63, 2000.12].

1.2.2 Relevant technical specifications

(1) 《Technical Guidelines for Environmental Impact Assessment》（HJ/T2.1~2.3-93, HJ/T2.4-1995, HJ/T19-1997, NEPA）;
(2) 《Environmental Impact Assessment Specification for Road Construction Project (tentative)》（JTJ005-96, MOC）;
(3) 《Environmental Protection Design Specification of Road》（JTJ/T006-98, MOC）;
(4) 《World Bank Operational Policies and Guidelines》; World Bank Safeguard Policies, including Operational Policies(OP), Best Procedure(BP), Good practice(GP) and Operational Directives(OD). They are:
  ● Environmental Assessment (OP/BP/GP4.01);
  ● Involuntary Resettlement (OP4.12);
  ● Cultural Property (OP4.11);
● Natural Habitats (OP/BP4.04);
● Indigenous People (OD4.20);
● Forestry (OP/GP4.36);
● Safety of Dams (OP/BP4.37);
● Pest Management (OP4.09);
● Projects in Disputed Areas (OP/BP/GP7.60);
● Projects on International Waterways (OP/BP/GP7.50).

(5) 《Notice about Ambient Noise in Environmental Impact Assessment in Construction Projects such as Highway, Railway (Including Light Railway)》 (environment〔2003〕No 94, 2003.5.27).

1.2.3 Relevant documents in the project preliminary work

(1) 《Feasibility Study Report for Ailing (Jiangxi and Fujian Border)-Ruijin Section of Xiamen-Chengdu Expressway》 (K0+000~K31+000 with total length of 31 km), Jiangxi Provincial Transportation Design Institute, May 2005.

(2) 《Two-Stage Preliminary Design for the New Project of Ailing (Jiangxi and Fujian Border)-Ruijin Section of Xiamen-Chengdu National Expressway》 (K0+050~K30+818.5 with total length of 31 km), Jiangxi Provincial Transportation Design Institute, July 2005.
2 Environmental impact assessment conclusions

2.1 Ecological environment

(1) The current ecological environment in the assessment scope of the proposed highway is good. The highway will take up a permanent land size of about 3188.57 mu. The land occupation type includes forestland, paddy field, non-irrigated field, wasteland, etc. The construction of the highway will cause certain agricultural economic losses, but will not produce remarkable influence on the distribution pattern of the land and vegetation.

(2) Subgrade excavation and earth/stone filling of the proposed highway construction will change the landform and topography in some areas to a certain extent. But corresponding engineering protection measures taken during the design, construction and operation stages of the highway can minimize such adverse effects on vegetation, land utilization and farmland change.

(3) Within the assessment scope of the proposed highway there is no natural reserve, no rare and endangered animals and plants distributed there. The engineering construction’s impact on vegetation is mainly the cutting, rooting, burying and trampling of trees, fruit trees, flowers and plants, bush and farmland crops in the acquired lands during construction stage. Some small animals living there will be threatened to some degree during the whole construction stage of the highway. The above impact can be compensated for to a certain degree through the greening and planting measures.

(4) Within the assessment scope for this highway, the animal species are mostly domestic animals, poultry and some common little wild animals that are few in population and are not very demanding for living environment and are adaptable to human activity. This road construction has not caused and changed their habitat environment greatly, will not interfere their normal life, which can still continue surviving in the areas along the route.

2.2 Water environment

(1) The assessment results indicate that: in the three customary monitoring cross-sections of Mianjiang river, the pH value, ammonia nitrogen and biochemical oxygen demand meet class III criteria of 《Surface Water Environmental Quality Standard》 (GB3838-2002) while the petroleum and chemical oxygen demand exceed class III criteria of 《Surface Water Environmental Quality Standard》 (GB3838-2002), of which the COD excess is relatively large. The proposed Mianjiang river super-large bridge site is located about 5km upstream the monitoring cross-section of Ruijin Airport with relatively similar water quality.

(2) During the construction stage, because earth borrowing and filling may cause silt of...
certain volume to enter into water bodies along the route, which will produce certain influence to the water quality of some rivers and canals. In building subgrade at the two banks of river-crossing bridges, measures shall be taken to reduce and avoid the impact on water body, which can be resumed after construction is finished.

3) The bridge substructure construction is separated from road section construction campsite, and the sanitary sewage emission of each campsite is only 3.2-6.4 tons, discharged in a dispersed and temporary manner. Through setting up septic tank and effective management, the influence of sanitary sewage during construction stage can be acceptable. So the bridge substructure construction for the proposed highway will only have a slight negative effect on water environment. In addition during construction stage the construction waste oil will be collected, deposited and transported to designated places for treatment, thus will not exert an unfavorable influence on the surrounding environment either. The boring dregs of bridge construction are required to be transported out of river district and be piled up, and corresponding environmental protection measures shall be taken to prevent water body pollution.

4) The water pollution sources during operation stage are mainly sewage from tollgates, management stations, parking lots, and maintenance divisions. The sewage must be treated to meet national class 1 discharge standard before discharging. Because the above-mentioned facilities only produce small amount of emission, the total pollutant emission is not big, and the treated sewage will be discharged up to standard into the side ditches of drainage system of the highway; after flowing through brooks at a long distance, it flows into the nearby river with very low concentration. So, a small amount of sewage water discharged up to standard from the above-mentioned service facilities has a little effect on local water environment.

5) During the operation stage, pavement runoff is not allowed to enter into rivers and canals directly. Automobile pollutants’ influence on water quality is very small, and will not influence the agricultural irrigation water either. The flow and velocity of Mianjiang River which the proposed highway overcrosses are relatively stable with greater dilution ability. Within the assessment scope of downstream bridge site, there is no centralized type drinking water intake. So, it can be concluded that bridge floor runoff’s impact on water quality is very small.

6) This project will not cause great adverse effect on farmland irrigation along the route. Water conservancy projects such as river and channel that are intruded will be reconstructed according to their existing capability.

7) In the next stage design it is suggested to optimize bridge and culvert design. Farmland irrigation system and water supply/drainage facilities that are intruded and separated by subgrade shall be restored.

2.3 Acoustic environment

1) Within the assessment scope there is no large-scale industrial and mining enterprises, the
traffic noise of existing railways, national roads, provincial roads, county roads are the main sources of noise pollution, followed by the living and production noise of residents in most monitoring points, the applicable noise criteria are not exceeded. The major noise source is traffic noise on existing roads; the acoustic quality along the route is basically good.

(2) Construction noise will have a certain impact on the acoustic environmental quality along the route, this kind of noise impact mainly appears in a range 130m from construction site in daytime and 480m from construction site in nighttime.

(3) In 100m beyond construction site and its construction/transportation roads (detour roads) the acoustic impact is relatively small, but will still exert a relatively great influence on people within 50m, especially construction noise at night will influence their rest and sleep.

(4) It is required to carry out environmental monitoring on sensitive locations, to supervise and promote good-mannered construction, to regulate construction, and to guarantee residents' normal life and study.

(5) Assessing by class 1 standard limit in GB3096-93, the farthest standard-satisfying distances in daytime along the two sides of the highway in short-term stage, mid-term stage and long-term stage are 54m, 130m and 185m respectively from road center line; the farthest standard-satisfying distances in nighttime along the two sides of the highway in short-term stage, mid-term stage and long-term stage are 119m, 155m and 332m respectively from road center line. Assessing by class 2 standard limit in GB3096-93, the farthest standard-satisfying distances in daytime along the two sides of the highway in short-term stage, mid-term stage and long-term stage are 32m, 69m and 101m respectively from road center line; the farthest standard-satisfying distances in nighttime along the two sides of the highway in short-term stage, mid-term stage and long-term stage are 73m, 96m and 191m respectively from road center line. Assessing by class 4 standard limit in GB3096-93, the farthest standard-satisfying distances in daytime along the two sides of the highway in short-term stage, mid-term stage and long-term stage are 20m, 20m and 27m respectively from road center line; the farthest standard-satisfying distances in nighttime along the two sides of the highway in short-term stage, mid-term stage and long-term stage are 43m, 57m and 142m respectively from road center line. It is suggested that planning department not to approve building schools and hospitals that have high acoustic quality demand within 332m from both sides of the highway, and building civilian houses within 142m.

(6) Prediction and calculation conducted for the 22 sensitive locations of the recommended scheme show that all sensitive locations are excessive in standard.

(7) Prediction and calculation conducted for the 12 sensitive locations of the alternative scheme I for the comparison section show that all sensitive locations are excessive in standard.
For the standard-exceeding sensitive locations during operation stage, it is recommended to build sound barrier and to install sound-proofing windows with an investment of 13.78 million yuan.

The monitoring points are Dongtouling, Pinghu, Hulipai, Songshanxia, Jiantounao, village 1, Sangongwo, Xiaoxia, Qiganxia, Xiashabei, (Xiashebei, Shangshebei, Shaba), and village 2, a total of 12 points.

2.4 Ambient air

The areas the highway runs by are mostly rural areas with the outdoor ambient air kept in natural condition. There is no large-scale pollution source in the assessment scope along the route, and the existing pollutants are automobile tail gas, pollutants produced by people’s life and production, etc. But the emission is relatively small.

The NO₂ and TSP average daily concentrations along the highway all comply with class II air quality standard of GB3095-1996, the monitored results indicate that the environmental air quality is good along the route.

The main environmental problem is TSP and bituminous smoke pollution during highway construction stage. Stabilized soil mixing station shall be far away from sensitive locations, attention shall be given to workers’ labor protection. Construction roads and material transportation roads shall be sprinkled with water and road surface shall be cleaned, roadbuilding material transporting vehicles shall be covered with geotextile. Stock grounds shall be far away from residential areas and shall be covered. In filling subgrade water shall be sprinkled in time; the bituminous concrete mixing station should be located 100m away from leeward wind direction of sensitive locations.

The distance in which the NO₂ peak hour concentrations of the proposed highway during the short, mid and long-term operation stages can meet class 2 limits for ambient air quality standard is 20m from road center line; the distance in which the NO₂ daily average concentrations during the short-term and mid-term stages can meet class 2 limits for ambient air quality standard is 20m from road center line; the distance in which the NO₂ daily average concentrations during the long-term stages can meet class 2 limits for ambient air quality standard is 30m from road center line.

2.5 Social environment

Construction of the proposed highway will exert a positive influence in promoting social
and economic development, in promoting rational adjustment of industrial sectors in areas along the route, in fostering the social and economic development and tourist resource development in areas along the route and in the whole Jiangxi Province, in improving the local investment environment, and in promoting structural adjustment of three major industries.

(2) Construction of the proposed highway will unavoidably take up some lands and cultivated lands, but the overall influence is not big in general. Land allocation and use value transformation can mitigate land occupation’s impact on agricultural economy.

(3) It is required to do good removal and resettlement work, to conscientiously enforce local government’s removal and resettlement policy. Because reasonable number of overpasses and passageways will be set up, impact on life convenience of residents along the route is not big.

(4) Operation of the proposed highway will alleviate the traffic pressure imposing on original existing roads, will improve traffic environment, and will reduce traffic accidents.

(5) The construction unit will strengthen publicity on historical relic protection, protective measures shall be made available to underground historical relic being found during construction, which shall be traced and monitored.

2.6 Pollution risk of transportation

(1) Though accident probability of hazardous cargo transportation is extremely small, but once the accident takes place, the consequence will be very serious. The construction department will formulate emergency plan, shall enhance training and management and shall strengthen emergency handling ability so as to reduce pollution risk to a minimum.

(2) Analyses conclude that this project has a relatively strong emergency ability to handle traffic accident.

2.7 Alternative schemes

After route comparison in the 《Preliminary Design》 stage, the recommended scheme is the best scheme in environmental protection. In order to do good environmental protection work for this project conscientiously, it is advised that the designing unit pay attention to solving the following problems at next stage:
(1) In high-fill and deep-cut sections, it is required to further study the design plan for slope protection.

(2) At the design of next stage, attention should be paid to the environmental protection and water and soil conservation of the highway itself and the earth borrow and waste banks.

(3) It is required to conscientiously implement simultaneous design between the environmental protection project and main project works.

2.8 Profit/loss analysis of environmental economy

(1) National economic evaluation and financial evaluation of this project indicate that it has certain anti-risk ability.

(2) The environmental protection investment needed by the proposed highway is about 20.852 million yuan, accounting for 2.02% in the total investment for the project.

2.9 Environmental protection, management and monitoring plans

(1) The environmental protection management during construction and operation stage for this project are executed by Jiangxi Provincial Communication Department planning office, Jiangxi Provincial Communication Department World Bank loan project office, and Jiangxi Provincial Expressway Administration.

(2) The monitoring cost for this project during construction stage is 225,000 yuan, and the monitoring cost during operation stage is 180,000 yuan.

(3) The construction unit has already established a removal and resettlement office and a coordinating group for design, resettlement and environmental protection, responsible for the environmental management and removal/resettlement of this project.

(4) Detailed environmental management plan (EMP) has already been formulated so as to finalize the environmental mitigation measures and implementation of environmental monitoring plan.

2.10 Public participation

(1) Construction of the proposed highway is a rare good chance to the areas along the route, especially to the development of county towns where the route passes. Local government and
residents along the route spare no effort to support this highway to pass in front of their “own doors”.

(2) Because people along the project, especially those who may be subject to land occupation, removal and resettlement do not still know compensation policies about land occupation, removal and resettlement in road construction, it is suggested that during the land occupation, removal and resettlement for this project, such policies and compensation standard shall be publicized to concerned people along the route through local government so as to make this project familiar to and welcomed by the people.

(3) For possible environmental problems brought out by this project, the environmental assessment unit and design unit have already put forward corresponding environmental protection measures such as sound-proofing window, sound barrier, and environmental management in construction stage, etc.

(4) At next stage various kinds of media such as broadcast, TV, newspaper, etc., will be utilized to release information to the public, to offer unobstructed access to environmental file inquiry and environmental complaint telephone.

(5) It is required to cooperate with environmental protection department to solve and deal with public appeal and complaint in time.

(6) According to various environmental protection measures put forward in the assessment report, Jiangxi Provincial Expressway Administration will carry out follow-up investigations in all period during the design, construction and operation stage.

2.11 Comprehensive assessment conclusion

In sum, the development, construction and operation of this project will produce certain adverse impacts on the ecological environment, resident's life and production activity along the route, but so long as the mitigation measures proposed by this report are conscientiously implemented, such adverse impacts produced can be effectively controlled and can be reduced to a minimum acceptable to the environment. The route alignment is basically rational; the social and economic benefits of the project are remarkable. This assessment concludes that in terms of environmental protection, construction of this proposed highway is feasible.
3 Mitigation measures for Environmental impacts

3.1 Mitigation measures for ecological environmental impact

3.1.1 Design stage

(1) To further optimize and adjust the alignment, to reduce occupation of cultivated lands, to balance cut/fill volumes and to reduce waste volume and the number of earth borrow pits and waste banks.

(2) Site selection for construction campsite shall avoid farmland or shall occupy as little farmland as possible. To rationally arrange construction plan, to reduce the time for temporary land occupation.

(3) When the highway passes through high mountains and natural forestlands, it shall pass mainly in the form of tunnel and bridge so as to reduce the mileage of cut/fill works, thus reducing destruction on vegetation and plant as much as possible. The present design scheme basically adopts tunnels and bridges to pass the natural forestlands.

(4) To design subgrade water drainage and protection works, such as cutoff trench, side ditch, facing wall, slope protection, retaining wall, crib protection etc., which can not only stabilize the subgrade but also can prevent and control soil erosion.

(5) The original appearance of rivers and valleys should be maintained as much as possible so as to reduce river course realignment and to reduce the clearance of grass and trees in the rivers and valleys.

(6) The guardrail in bridges should choose material with high strength.

(7) Selection of earth borrow pits and waste banks: earth borrow pits and waste banks are forbidden to locate in basic farmland protection zone, instead they should be preferably located in secondary vegetation land with grass and wastelands, thus not directly influencing the primary vegetation. In addition, in rainy season the intensity of rainstorm is relatively large and duration is relatively long, so construction stage should choose dry season, thus helpful to construction. Before rainy season comes, good preparations must be taken to prevent soil erosion, concretely by piling waste earth neatly, excavating drainage ditches and building retaining walls so as to reduce soil erosion’s destruction to natural vegetation and to maintain local rivers in their normal conditions too. Waste earth banks shall not be located in river course and along rivers so as to avoid water pollution and to avoid mud-rock flow destroying downstream river.

(8) For earth borrow pits and waste banks, environmental protection design shall be carried out, and the following principles shall be followed to formulate tunnel waste dreg utilization plan.

① The tunnel waste dreg is used as filling materials for subgrade outside tunnel and for
bridge embankment, while the transport distance is not too far;

② The tunnel waste dreg is used to fill hillside wasteland to turn into construction site so that they are unlikely to be destroyed by flood when mountain torrent comes and endanger downstream farmlands;

③ When the tunnel portal area is good farmland and there is wasteland in distance, they shall be delivered to the waste land in long-distance;

④ When near the tunnel site there is cultivated land and waste slags must take up farmland, the topsoil should be first shoveled away, after the project is finished, the original topsoil shall be covered on waste banks so as to restore cultivation.

(9) To rationally arrange construction season and time: to rationally arrange construction in dry season so as to reduce destruction on river and water quality; blasting and construction are forbidden at night in order to reduce impact on local wild animals.

(10) Propagation (wildlife and environmental protection propagation, and manufacturing propagation boards) should be conducted and supervisory organization should be set up before construction.

(11) The afforestation design of the highway shall be in pace with the engineering design of the main project, priority shall be given to adopting local arbor, shrub, and grass in the design in order to restore and compensate for the vegetation.

3.1.2 Construction stage

(1) Education for environmental protection shall be strengthened to construction workers so that they will observe national and regional laws and relevant regulations so as to protect natural resources, not to injure wild animals, not to cut down trees arbitrarily, and to consciously protect various kinds of animals, plants and natural landscapes in natural forestlands along the route.

(2) The tunnel (entrance and exit) will be the place needing special monitoring during construction. Because in road construction the tunnel is always a controlled project with long construction time, large volume of waste earthwork disposal, thus during tunnel construction, it is required to strictly control the piling of materials and the collecting/disposing of waste earthwork.

(3) Construction of pier in bridge construction will inevitably exert an influence on the vegetation, so it is required to strictly control the size of vegetation occupation and impact on peripheral vegetation. Relevant national laws and regulations shall be strictly followed to go through the formalities in acquiring forestland and vegetation, casual tree cutting and surface vegetation clearing are forbidden.

(4) Construction time in the natural forestlands shall be shortened as much as possible, and construction at night is forbidden.

(5) Life garbage and sewage produced from construction campsites shall be disposed of collectively or be made into fertilizers.

(6) For temporary land occupation by detour roads and working sheds, their destruction on
vegetation shall be reduced to a minimum. If detour roads pass through wooded section with big
trees, the detour roads shall pass around it, the trees around working sheds should be kept to a
maximum extent. The establishment of detour road shall not destroy natural landscape, shall not
move excessive earthwork, and shall not cause collapse.

(7) Attention shall be paid to the protection of river course during construction, construction
shall be mainly in dry season, before rainy season comes it is required to dredge the river course and
to excavate drainage canals in construction site, and to guarantee unobstructed river flow and clean
water quality in the river. As far as drinking water is concerned, it is required to solve the water
problem for residents before the project construction begins, and to consider the influence on
construction stage and in the future.

(8) Various kinds of construction behaviors such as earth borrowing and waste disposal shall
be carried out strictly according to the designing requirement, ecological restoration shall be timely
undertaken in earth borrow pits and waste banks. When excavating the acquired cultivated land, the
topsoil (30cm) should be kept in order for use in reclaiming and compensating for cultivated land.

(9) Construction vehicles shall run on temporary roads, shall not run into farmlands and
forestlands.

(10) To reduce the quantity and size of construction site: Construction shall be carried out in
designed construction site, earth borrow pits and waste banks shall not be enlarged at will so as to
reduce excavation surface. If construction can't be conducted at once, don't enter the construction
site too early.

(11) Each protection measure shall be implemented along with the main project in order to
prevent pavement runoff in rainy season from directly eroding slope and leading to soil erosion.

(12) Management of solid waste during construction stage

① Solid wastes shall not be thrown or spilled over along the route during transportation.

② Greasy dirt of construction machinery shall be treated collectively, solid wastes with
greasy dirt can't be thrown casually on ground, rather they shall be treated collectively.

③ Construction campsite shall set up septic tank and dustbin, the contractor shall remove
the garbage and clear up the septic tank on time.

④ The driving mud from bridge construction shall be transported outside river district and
be piled in favorable terrain place. The waste mud piling shall be protected mainly by blocking and
arresting; after the place is chosen, mud arresting dam shall be first built in downstream place of
waste mud, drainage ditches shall be built in surrounding place according to water catchment, which
connect with the original drainage system, then waste mud can be piled up. After waste mud piling,
vegetation shall be restored as much as possible.

⑤ The planning and the operational procedure of construction shall be followed to strictly
control and to reduce the remaining supplies. In case of remaining materials, they shall be preserved
well in an orderly manner, and be kept properly as for use in repairing rural roads or buildings in
surrounding area.

⑥ Facilities, equipment and places that collect, store, transport and handle the solid wastes should be strengthened in management and maintenance so as to guarantee their normal running and use.

3.1.3 Operation stage

(1) According to road afforestation design requirement, it is suggested to continue tree planting and grassing in slopes, median separators, interchanges and parking areas of the proposed highway in order to achieve the purposes of restoring vegetation, protecting subgrade and reducing soil erosion.

(2) For slopes, earth borrow pits and waste banks, detour roads, tunnel mouths where their vegetation is damaged, measures should be taken as soon as possible so as to restore the vegetation.

(3) In restoring vegetation, only local indigenous plants can be used, any exotic plant species are forbidden.

(4) It is to further perfect each engineering measure, planting measure and land reclamation measure for water and soil conservation according to the designing requirements, to scientifically and rationally implement a three-dimensional plantation pattern which combines grass, flower, bush and arbor. Especially for earth slopes, afforestation can be carried out in later construction stage in order to protect subgrade slope stability and reduce soil erosion.

(5) Silt in overflow culverts should be cleared in time in order to ensure unobstructed irrigate river system.

(6) Carrying out maintenance for protection works and afforestation project.

(7) Solid waste management during operation stage

① Through formulating and propagating regulations, it is forbidden that passengers casually throw out garbage such as beverage bags, easy-open cans, etc. on the highway so as to ensure traffic safety and sanitation/hygiene along both sides of the highway.

② The sewage and garbage in parking areas and management stations should be cleared periodically, delivered to and disposed of collectively in garbage disposal grounds along the highway, casual throwing-away is forbidden.

3.2 Mitigation measures for water environmental impact

3.2.1 Design stage

(1) To optimize and perfect the small bridge and culvert design; for each canal and pond occupied or cut off by the subgrade, remedial measures shall be taken by relocating them under the prerequisite of not compressing the water-discharge cross-section of original river and canal and not influencing the function of original canal and ditch. It should also guarantee that new opening precedes relocating.
(2) Water drainage ditches in large bridge floor should be designed strictly according to design specification, with the drainage ditch cross-section be calculated based on the bridge floor runoff produced by the maximum rainfall over the years so as to guarantee that the runoff of bridge floor is discharged in time.

(3) In the next design stage, full emphasis should be paid to protect surface water body. During bridge substructure design, related regulations should be followed to explicitly stipulate that the wastes such as driving slags shall not be discharged into surface water body directly; local water conservation and environmental protection departments and other concerned departments shall be consulted to reasonably locate the positions of borrow pits, driving slags shall be used as much as possible in paving subgrade so as to prevent soil erosion from polluting farmland and river system.

(4) For the tollgate stations, management stations, parking lots, and maintenance divisions, necessary sewage disposal equipment shall be designed and installed according to their functions, staffing and mobile population so as to ensure that the treated sewage can reach class I criteria of GB8978-1996 《Sewage Comprehensive Discharge Standard》 before discharge.

(5) In order to prevent vehicles, especially the hazardous cargo vehicles, from being fallen into river and reservoir along the route thus polluting water quality, bridge guardrail designing should be strengthened for bridges overcrossing Mianjiang River.

3.2.2 Construction stage

(1) Prevention and control measures for construction waste water pollution
   ① The project contract should clearly specify provisions for preventing sprinkle and leakage during transportation of roadbuilding materials (for example asphalt, fuel oil, chemical, pulverized coalash, cement, sand, and stone), their piling locations shall not be near water body or breeding pond in order to avoid being washed away by rain water into water body, thus causing pollution.

   ② Deleterious construction materials such as asphalt, fuel oils, and chemical substances shall be covered when piled in stock ground so as to reduce pollution caused by rain wash. Within 100m from riverbank, it is prohibited to set up stock grounds (materials yard), waste banks, and construction campsites.

   ③ Construction waste water cannot be discharged into rivers and reservoirs directly. The construction waste water shall be circulated and recycled as much as possible so as to effectively control the construction waste water’s pollution on local water quality due to its discharge with exceeded standard.

(2) Control measures for oil-containing wastewater
   Oil-containing wastewater shall be controlled by adopting controlled construction process and clean production plan.

   ① Advanced equipment and machinery shall be selected as much as possible so as to
effectively reduce the quantity of oil leakage, bleeding, drop and spillage, and machinery repair times, thus reducing the production quantity of oil-containing wastewater.

② During construction process involving inevitable oil leakage, bleeding, drop and spillage, solid oil-absorption materials shall be used as many as possible (for example cotton yarn, saw dust and so on) to collect the oil and transform them into solid substance thus avoiding producing excessive oil-containing waste water. For oil dirts that are seeped into the ground, they should be scraped promptly for collection and sealing, and shall be hauled to garbage ground for processing.

③ Repair and maintenance of machinery, equipment and transportation vehicles shall be conducted in the repair zone of various road section as much as possible to facilitate collection of oil-containing waste; in case that concentrated repair cannot be made because the production quantity of oil-containing wastewater is generally smaller than 0.5m³/d, then all can be absorbed by solid oil-absorption materials for collection, sealing and delivery to outside.

④ In construction site and machinery repair ground, horizontal flow precipitation tank shall be set up, the oil-containing waste water is collected by the precipitation tank, after simple treatments such as acid and alkali neutralization, precipitation, oil separating and dreg removing, the concentrations of oil and other pollutants will reduce. After construction, the precipitation tank will be buried by earth.

⑤ Collected oil-soaking waste shall be packaged, sealed and hauled to outside along with other solid wastes produced from construction site, the destination of hauling shall select towns with garbage burying or treatment ability.

(3) Control measures for life sewage

① Dining and laundry of construction workers will be managed in a unified way such as concentrated dining and laundry in fixed place and time so as to reduce life sewage production volume as much as possible. During laundry, the detergent amount shall be controlled, hot water or other means can be substituted for so as to reduce the detergent content in sewage.

② Septic tanks will be set up in construction campsites so as to collect excrement and dining/laundry sewage, the excrement can be used for fertilizing the soil, the dining/laundry sewage can be used in agricultural irrigation after being precipitated. After construction, septic tanks will be buried by earth.

③ Life garbage will be loaded into garbage can, which will be cleaned and hauled out periodically, or a garbage pit can be set up to ferment them so as to be used in fertilizing the soil. After construction, the garbage pit will be buried by earth, if surface vegetation is damaged, vegetation shall be restored.

(4) Protection measures for bridge construction

① For bridge foundation and pile locating in river course, its boring dregs from foundation excavation shall not be discharged into water body directly, the boring dregs must be transported to
nearby planned waste bank. During construction, the bridge construction site shall set up simple sedimentation tank in which the boring dregs and mud are precipitated and dried, then hauled to the waste bank.

② For other bridges overcrossing canals, the bridge pile foundation construction shall be conducted in dry season as preferably as possible, and shall avoid construction in flood season and high water period, the earth and stone works excavated from foundation and pile construction shall be used as much as possible, those that cannot be used will be hauled to nearby waste bank.

③ During bridge construction, maintenance and repair of construction machinery shall be well conducted so as to prevent the fuel oil from leaking and polluting the water body.

3.2.3 Operation stage

(1) Sewage disposal equipment in parking lots, management stations and maintenance divisions shall be repaired and maintained periodically to ensure that the treated sewage can reach class I criteria of GB8978-1996 《Sewage Comprehensive Discharge Standard》.

(2) Water quality monitoring plan shall be carried out, supplementary environmental protection measures shall be taken according to the water quality monitored results.

(3) Vehicles that leak or overload bulk goods are forbidden to run on the highway in order to prevent the bulky goods from spillover and causing water pollution along the route.

(4) Water pollution risk prevention measures for river-crossing bridges are presented in section 3.6.

3.3 Mitigation measures for acoustic environmental impact

3.3.1 Design stage

(1) It is required to design the material transportation route rationally to keep distant from residential areas so as to avoid impact of wind-borne flying dust and noise on residents.

(2) It is suggested to further optimize and adjust design plan of some local route through dodging and relocating etc. so as to make the route keeping away from acoustically sensitive locations.

(3) If constrained by local conditions, the route alignment cannot dodge or feasibly impossible to dodge in terms of technical and economic justification, noise-reduction measures shall be considered for the influenced sensitive locations in acoustic environment from road design, at the same time the funds for implementing these measures shall be budgeted.

(4) Environmental protection measures that need engineering design proposed in the environmental impact report should be designed for environmental protection simultaneously during the preliminary stage.

(5) According to prediction, different sensitive locations shall adopt different noise-reduction measures such as removal and installing noise-reduction windows, etc. which will be included in the
3.3.2 Construction stage

(1) To strengthen construction management. When the construction site lies near schools, the construction unit is required to know the schooling schedule, strong-noise construction machinery is forbidden to operate at schooling time during the day; in construction site 150m within which there is dense residential area, high-noise construction machinery is forbidden to operate at night (22:00 - 06:00). If required by production techniques, successive construction must proceed at night, the construction unit must obtain approval from local people's government above county-level or responsible authority, and should also do good propaganda in advance and shall utilize portable or temporary sound barrier as noise-reduction measure.

(2) Construction unit must select construction machines and transportation vehicle complying with relevant national standards, shall select preferably low-noise construction machinery and techniques, for example substituting hydraulic tool for atmospheric pressure tool, substituting low-noise drive cast-in-place piling for impact or vibration type piling. Fixed mechanical equipment with large vibration should be installed with vibration-reducing base, at the same time attention should be given to their maintenance and correct operation so as to maintain the noise of roadbuilding machinery to the lowest level. Construction machinery with high noise shall adopt provisional noise-isolating measures. Material stock grounds and mixing stations should be located 300m away from acoustically sensitive locations.

(3) Noise of roadbuilding machinery is characterized by abruptness, irregularity, discontinuity and high strength, etc. According to investigation, noise at the construction site sometimes goes beyond class 4 noise standard, which can be generally alleviated by changing construction method. For example high-noise operation can be carried out during daytime (06:00-22:00), or the operation time of each construction machinery can be adjusted. Noises produced from material transport, shocking and people’s shouting during construction period can be alleviated through contractor’s good-mannered construction activity and effective management.

(4) Detour roads shall be far away from schools, hospitals, and residences, and shall not cross acoustic sensitive locations. When there are large residences 50m within both sides of detour road, hauling of building materials is forbidden in this detour road at night.

(5) In order to supervise and protect residents’ production and life, and school environment, acoustic environmental monitoring will be carried out in construction stage. The supervising engineer is required to sample-monitor construction site within 100m of which there are larger residential areas or schools during construction stage. Based on monitored results, corresponding noise prevention measures shall be adopted, for instance: limit working time, change hauling route, adopt temporary sound barrier, etc.

(6) The work health standard shall be followed to control construction workers’ working hours, personnel protective measures shall be provided to mechanical operators and
concerned personnel, such as wearing ear plug and helmet, and so on.

(7) Hauling roadbuilding materials in the National Road 323 and other roads may deteriorate the acoustic environmental quality in sensitive locations along the route; in order to accurately and timely grasp the acoustic environmental quality in sensitive locations along the construction road (including detours), during construction stage, the supervising engineer is required to monitor the noise in sensitive locations along two sides of G323. According to the monitored results, if necessary the material hauling route can be considered to change, if unable to avert, temporary sound barriers can be built or some economic compensation can be made with agreement from local residents.

3.3.3 Operation stage

(1) It is suggested that planning department not to approve to build schools and hospitals that have high acoustic quality demand within 332m from both sides of the highway, and to build houses within 142m, otherwise the acoustic environment protective measures should be solved by the construction units themselves.

(2) Acoustic environmental protection measures for sensitive locations with predicted noise excess

In order to ensure a quiet working, studying and living environment for residents along the proposed highway, corresponding noise prevention measures are taken according to the predicted noise excess, positions, scale, local conditions and project characteristics of sensitive locations.

Generally speaking, the protective measures available for acoustic environment include: adjust the highway alignment, build sound barrier, remove resident's houses, install sound-proofing windows and build wall enclosures, etc.

See Table 3.3.3-1 for the comparison of each measure and their noise reduction effects.
Table 3.3.3-1 List of commonly used noise-reduction measures

<table>
<thead>
<tr>
<th>No</th>
<th>Measure</th>
<th>Noise-reduction index</th>
<th>Cost</th>
<th>Applicable conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sound barrier</td>
<td>6~8dB</td>
<td>2500 yuan/linear meter</td>
<td>① Sensitive building &lt; 50m from road center line</td>
</tr>
<tr>
<td></td>
<td>Sound boarding + noise barrier</td>
<td>8~10dB</td>
<td>3200 yuan/linear meter</td>
<td>② Relatively centralized residence</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>③ Subgrade height parallel toot higher than house floor height</td>
</tr>
<tr>
<td>2</td>
<td>Remove resident's houses for environmental protection</td>
<td>Distinct from noise source</td>
<td>30000~50000 yuan each house</td>
<td>New housing land available to sparse families</td>
</tr>
<tr>
<td>3</td>
<td>Build noise-proofing walls for residents’ houses</td>
<td>4~6dB</td>
<td>500 yuan/linear meter</td>
<td>① Sensitive building &gt; 50m from road center line</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>② House floor height parallel toot higher than subgrade height</td>
</tr>
<tr>
<td>4</td>
<td>Install ventilation sound-proofing windows</td>
<td>15~20dB</td>
<td>3000 yuan each</td>
<td>Wide application, especially suitable to high-rise building</td>
</tr>
</tbody>
</table>

Because this project is still in its feasibility study stage, and the preliminary design has not finished yet, the recommended acoustic protection measures are subject to further refinement in the next stage. The available measures that can be used are mainly to remove the households. The removal and resettlement cost for each household is 30000 yuan; the cost for sound barrier along the highway is 2500-3200 yuan/linear meter; the cost for installing ventilation sound-proofing window is 10000 yuan per each household.

Comparing the above-mentioned measures, sound barrier is better in noise reduction effects, which needs no lands for new residence houses and takes up little land, but which also involves large investment, uneconomical to sensitive locations with scattered households. The advantage of household removal is that it can solve the noise pollution problem in one single step with moderate investment, but needs lands for new residence houses. Installing ventilation sound-proofing windows has remarkable effect, but needs forced ventilation. See Table 3.3.3-2 for the acoustic environmental protection measures of sensitive locations. Before the measures are implemented, opinions shall be solicited from concerned households, if disagreed with the recommended measures, other alternative measures should be considered. For sensitive locations with small predicted excess, mid-term monitoring will be taken, and according to the monitored results, further measures will be adopted such as house removal or installing sound-proofing facility.
Table 3.3.3-2 Acoustic environmental protection measures of sensitive locations in the recommended scheme of the proposed highway

<table>
<thead>
<tr>
<th>No</th>
<th>Name of sensitive locations</th>
<th>Noise excess and environmental protection measure comparison</th>
<th>Recommended measure</th>
<th>Noise-reduction effect</th>
<th>Investment</th>
<th>Implementation time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dongtouling K6+650～K7+080</td>
<td>Predicated noise excess: Noise excess by 0.9~7.1 dB in mid/long-term operation stage. Short-term monitoring will be taken and measures will be determined according to the monitored results. ① Sound barrier: to build sound barrier 500m long and 2.5 m high with an investment of 1.25 million yuan(2500 yuan/linear meter), centered residence, good effect. ② EP removal: within the assessment scope there are 50 households, to remove 40 households with a cost of 1.2 million yuan (30,000 yuan/household).</td>
<td>Sound barrier</td>
<td>Require acoustic design, noise reduction by more than 8dB</td>
<td>1.25 million yuan</td>
<td>Short-term operation stage</td>
</tr>
<tr>
<td>2</td>
<td>Xiewu K7+075～K7+430</td>
<td>Predicated noise excess: Noise excess by 1.4~10.3 dB in short/mid/long-term operation stage ① Sound-proofing window: 56 households with a cost of 560,000 yuan (10,000 yuan/household). ② EP removal: within the assessment scope there are 56 households, to remove 56 households with a cost of 1.68 million yuan (30,000 yuan/household).</td>
<td>Sound-proofing window</td>
<td>Noise reduction by more than 15dB</td>
<td>0.56 million yuan</td>
<td>Construction stage</td>
</tr>
<tr>
<td>3</td>
<td>Pinghu K7+150～K7+420</td>
<td>Predicated noise excess: Noise excess by 1.4~9 dB in mid/long-term operation stage. Short-term monitoring will be taken and measures will be determined according to the monitored results. ① Sound-proofing window: 18 households with a cost of 180,000 yuan (10,000 yuan/household). ② EP removal: within the assessment scope there are 18 households, to remove 18 households with a cost of 0.54 million yuan (30,000 yuan/household).</td>
<td>Sound-proofing window</td>
<td>Noise reduction by more than 15dB</td>
<td>0.18 million yuan</td>
<td>Short-term operation stage</td>
</tr>
<tr>
<td>4</td>
<td>Songwu K7+510～K7+775</td>
<td>Predicated noise excess: Noise excess by 2~11.1 dB in short/mid/long-term operation stage ① Sound-proofing window: 42 households with a cost of 420,000 yuan (10,000 yuan/household). ② EP removal: within the assessment scope there are 42 households, to remove 42 households with a cost of 1.26 million yuan (30,000 yuan/household).</td>
<td>Sound-proofing window</td>
<td>Noise reduction by more than 15dB</td>
<td>0.42 million yuan</td>
<td>Construction stage</td>
</tr>
<tr>
<td>5</td>
<td>Xinsongshaxia K10+930～</td>
<td>Predicated noise excess: Noise excess by 1.4~10.3 dB in short/mid/long-term operation stage.</td>
<td>Sound-proofing window</td>
<td>Noise reduction by more</td>
<td>0.20 million yuan</td>
<td>Construction stage</td>
</tr>
<tr>
<td>No.</td>
<td>Location</td>
<td>Predicated noise excess:</td>
<td>Sound-proofing window:</td>
<td>Noise reduction by more than 15dB</td>
<td>EP removal:</td>
<td>Costs (in million yuan)</td>
</tr>
<tr>
<td>-----</td>
<td>-----------</td>
<td>--------------------------</td>
<td>------------------------</td>
<td>-----------------------------------</td>
<td>------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Tianwu K12+425~K12+730</td>
<td>Noise excess by 0.4~8.9 dB in short/mid/long-term operation stage</td>
<td>20 households with a cost of 200,000 yuan (10,000 yuan/household).</td>
<td>Sound-proofing window: 17 households with a cost of 170,000 yuan (10,000 yuan/household).</td>
<td>EP removal: within the assessment scope there are 20 households, to remove 20 households with a cost of 0.6 million yuan (30,000 yuan/household).</td>
<td>Noise reduction by more than 15dB: 0.17 million yuan</td>
</tr>
<tr>
<td>7</td>
<td>Tianbei K12+775~K13+000</td>
<td>Noise excess by 0.7~9.5 dB in short/mid/long-term operation stage</td>
<td>21 households with a cost of 210,000 yuan (10,000 yuan/household).</td>
<td>Sound-proofing window: 21 households with a cost of 210,000 yuan (10,000 yuan/household).</td>
<td>EP removal: within the assessment scope there are 21 households, to remove 21 households with a cost of 0.63 million yuan (30,000 yuan/household).</td>
<td>Noise reduction by more than 15dB: 0.21 million yuan</td>
</tr>
<tr>
<td>8</td>
<td>Hulipai K15+675~K16+230</td>
<td>Noise excess by 5.5 dB in long-term operation stage</td>
<td>Mid-term monitoring will be taken and measures will be determined according to the monitored results.</td>
<td>Sound barrier: to build sound barrier 460m long and 2.5 m high with an investment of 1.15 million yuan (2500 yuan/linear meter), centered residence, good effect, and modest investment.</td>
<td>EP removal: within the assessment scope there are 21 households, to remove 21 households with a cost of 1.68 million yuan (30,000 yuan/household).</td>
<td>Require acoustic design, noise reduction by more than 6dB: 1.15 million yuan</td>
</tr>
<tr>
<td>9</td>
<td>Xinwujiang K16+320~K16+500</td>
<td>Noise excess by 0.1~8.7 dB in short/mid/long-term operation stage</td>
<td>Sound-proofing window: 10 households with a cost of 100,000 yuan (10,000 yuan/household).</td>
<td>Sound-proofing window: 10 households with a cost of 100,000 yuan (10,000 yuan/household).</td>
<td>EP removal: within the assessment scope there are 10 households, to remove 10 households with a cost of 0.3 million yuan (30,000 yuan/household).</td>
<td>Noise reduction by more than 15dB: 0.10 million yuan</td>
</tr>
<tr>
<td>10</td>
<td>Songshanxi K19+375~K19+640</td>
<td>Noise excess by 0.1~6.4 dB in mid/long-term operation stage</td>
<td>Sound-proofing window: 20 households with a cost of 200,000 yuan</td>
<td>Sound-proofing window: 20 households with a cost of 200,000 yuan</td>
<td>EP removal: within the assessment scope there are 20 households, to remove 20 households with a cost of 0.6 million yuan (30,000 yuan/household).</td>
<td>Noise reduction by more than 15dB: 0.20 million yuan</td>
</tr>
<tr>
<td>No.</td>
<td>Location</td>
<td>Predicated Noise Excess</td>
<td>Sound-BARRIER (Requirement and Cost)</td>
<td>Short-term Operation Stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------</td>
<td>-------------------------</td>
<td>--------------------------------------</td>
<td>---------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Jiantounao K19+710~K20+225</td>
<td>Noise excess by 1.3~7.6 dB in mid/long-term operation stage</td>
<td>① Sound Barriers: to build sound barriers 600m long and 2.5 m high with an investment of 1.50 million yuan (2500 yuan/linear meter), centered on residence, good effect, and modest investment. ② EP removal: within the assessment scope there are 20 households, to remove 20 households with a cost of 0.60 million yuan (30,000 yuan/household).</td>
<td>1.50 million yuan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Liaowu K20+980~K21+175</td>
<td>Noise excess by 1.8~10.8 dB in short/mid/long-term operation stage</td>
<td>① Sound-proofing Windows: 47 households with a cost of 470,000 yuan (10,000 yuan/household). ② EP removal: within the assessment scope there are 65 households, to remove 65 households with a cost of 1.95 million yuan (30,000 yuan/household).</td>
<td>0.47 million yuan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Village 1 K21+400~K21+750</td>
<td>Noise excess by 0.2~15.8 dB in short/mid/long-term operation stage</td>
<td>① Sound-proofing Windows: 20 households with a cost of 200,000 yuan (10,000 yuan/household). ② EP removal: within the assessment scope there are 20 households, to remove 20 households with a cost of 0.60 million yuan (30,000 yuan/household).</td>
<td>0.20 million yuan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Sangongwo K24+590~K24+720</td>
<td>Noise excess by 5.8 dB in long-term operation stage</td>
<td>① Sound Barriers: to build sound barriers 220m long and 2.5 m high with an investment of 0.55 million yuan (2500 yuan/linear meter), centered on residence, good effect, and modest investment. ② EP removal: within the assessment scope there are 18 households, to remove 65 households with a cost of 1.5 million yuan (30,000 yuan/household).</td>
<td>0.55 million yuan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Xin’aoxia</td>
<td>Predicated noise excess:</td>
<td>Sound</td>
<td>0.65</td>
<td>Short-term Operation Stage</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Noise Excess</td>
<td>Monitoring &amp; Measures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>-----------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| K25+550~K25+740 | Noise excess by 0.3~6.1 dB in mid/long-term operation stage | Short-term monitoring will be taken and measures will be determined according to the monitored results.  
① sound barrier: to build sound barrier 260m long and 2.5 m high with an investment of 0.65 million yuan (2500 yuan/linear meter), centered residence, good effect, and modest investment.  
② EP removal: within the assessment scope there are 28 households, to remove 28 households with a cost of 0.84 million yuan (30,000 yuan/household). |
| Painao K26+010~K26+160 | Predicated noise excess: Noise excess by 1.1~10 dB in short/mid/long-term operation stage | Sound-proofing window: 18 households with a cost of 180,000 yuan (10,000 yuan/household).  
② EP removal: within the assessment scope there are 18 households, to remove 18 households with a cost of 0.54 million yuan (30,000 yuan/household). |
| Qiganxia K26+485~K26+900 | Predicated noise excess: Noise excess by 5.3 dB in long-term operation stage | sound barrier: to build sound barrier 500m long and 2.5 m high with an investment of 1.25 million yuan (2500 yuan/linear meter), centered residence, good effect, and modest investment.  
② EP removal: within the assessment scope there are 68 households, to remove 68 households with a cost of 2.04 million yuan (30,000 yuan/household). |
| Sawanli K27+200~K27+700 | Predicated noise excess: Noise excess by 1.6~11.1 dB in short/mid/long-term operation stage | Sound-proofing window: 14 households with a cost of 140,000 yuan (10,000 yuan/household).  
② EP removal: within the assessment scope there are 14 households, to remove 14 households with a cost of 0.42 million yuan (30,000 yuan/household). |
| Xiashabei K27+700~K28+100 | Predicated noise excess: Noise excess by 1~7.4 dB in mid/long-term operation stage | Short-term monitoring will be taken and measures will be determined according to the monitored results.  
① sound-proofing window: 35 households with a cost of 350,000 yuan (10,000 yuan/household).  
② EP removal: within the assessment scope there are 35 households, to... |
| 20 | Xiashhebei, Shangshebei, Shaba K28+100～K28+500 | remove 35 households with a cost of 1.05 million yuan (30,000 yuan/household). | Predicated noise excess: Noise excess by 4.4 dB in long-term operation stage. Mid-term monitoring will be taken and measures will be determined according to the monitored results.  
① sound barrier: to build sound barrier 540m long and 2.5 m high with an investment of 1.35 million yuan (2500 yuan/linear meter), centered residence, good effect, and modest investment.  
② EP removal: within the assessment scope there are 78 households, to remove 70 households with a cost of 2.1 million yuan (30,000 yuan/household). | Sound barrier | Require acoustic design, noise reduction by more than 5dB | 1.35 million yuan | Mid-term operation stage |
| 21 | Village 2 K30+000～K30+200 | Predicated noise excess: Noise excess by 2.5 dB in long-term operation stage. Mid-term monitoring will be taken and measures will be determined according to the monitored results.  
① sound barrier: to build sound barrier 280m long and 2.5 m high with an investment of 0.70 million yuan (2500 yuan/linear meter), centered residence, good effect, and modest investment.  
② EP removal: within the assessment scope there are 20 households, to remove 20 households with a cost of 0.6 million yuan (30,000 yuan/household). | Sound barrier | Require acoustic design, noise reduction by more than 3dB | 0.70 million yuan | Mid-term operation stage |
| 22 | Shixiawan K30+025～K30+818.5 | Predicated noise excess: Noise excess by 0.8~9.6dB in short/mid/long-term operation stage.  
① sound barrier: to build sound barrier 800m long (400m for each side) and 2.5 m high with an investment of 2.0 million yuan (2500 yuan/linear meter), centered residence, good effect, and modest investment.  
② EP removal: within the assessment scope there are 121 households, to remove 80 households with a cost of 2.4 million yuan (30,000 yuan/household). | Sound barrier | Require acoustic design, noise reduction by more than 10dB | 2.00 million yuan | Construct ion stage |

Note: ① for sensitive locations during operation stage, the environmental protection measures can be properly adjusted according to monitored results.  
② before implementing the measures, the protected subjects’ opinions shall be solicited, if the recommended measures are not agreed, then alternative measures can be considered.

(3) Implementing noise monitoring plan (see Table 4.2-2) and according to the monitored results it is to determine whether to adopt supplementary acoustic environmental protection measures. Representative school and residential areas are chosen to conduct noise monitoring during the operation stage, and the monitored results shall be used to determine whether to take noise reduction measures or not. The monitoring points are: Dongtouling, Pinghu, Hulipai,
Songshanxia, Jiantounao, village 1, Sangongwo, Xinaoxia, Qiganxia, Xiashabei, (Xiashebei, Shangshebei, Shaba), and village 2, a total of 12 points.

(4) Strengthening traffic administration can effectively control traffic noise pollution. Vehicle of bad performance are restrained from running on the highway. When passing around towns and schools or other sensitive locations, the vehicles are forbidden to horn. The highway pavement shall be maintained regularly to guarantee evenness.

3.4 Mitigation measures for ambient air impact

3.4.1 Design stage

(1) Stone quarries, earth borrow pits, waste banks and mixing stations shall be located far away from residential areas and shall be in 300m away from leeward wind direction.

(2) It is required to design the material hauling route rationally to keep distant from residential areas so as to avoid influences of wind-borne flying dust and noise on residents.

3.4.2 Construction stage

(1) Stock grounds, stabilized soil and cement concrete mixing stations for highway construction shall be located in such places within 300m leeward of which there are no residences, hospitals, and schools. Mixing machines shall be well sealed and shall be installed with shock absorber and dust remover. Operators shall be provided with labor protection devices such as eyeshield and mask.

(2) Roadbuilding materials that are easy to spill should adopt wet method to transport, covered by tarpaulin to prevent flying dust pollution on atmosphere.

(3) Roads for hauling materials and construction site, especially stabilized soil mixing station, shall have necessary water sprinkling to prevent wind-borne flying dust. Water shall be sprinkled in dry weather, twice every day in the morning and afternoon respectively.

(4) In filled subgrade, water shall be sprinkled correspondingly according to material compaction requirement. The contractor must also often sprinkle water after material compaction so as to ensure that materials do not fly dust.

(5) Construction roads, construction sites and mixing stations shall be sprinkled by water to prevent dust flying.

(6) Management on materials which are apt to cause flying dust must be strengthened, which shall not be piled up in the open ground. The stock grounds shall be at least 300m away from sensitive locations such as school and village.

3.4.3 Operation stage

(1) To strengthen road management and pavement maintenance, to keep the road in good operation state, to reduce traffic congestion and jam.

(2) To strengthen management of vehicles hauling bulky materials such as coal, cement, grit
material and simple packaged chemical fertilizer and agricultural chemical, etc., and geotextile shall be covered when transporting the above-mentioned articles. These vehicles shall be inspected in the entrance of highway.

(3) To design afforestation and beautification project on highway boundary limits, to choose tree species that can purify the air, and to do good implementation of afforestation project and maintenance.

(4) To maintain tunnel air blowers and to guarantee good ventilation in the tunnel.

(5) To enforce ambient air monitoring plan, and to take supplementary environmental protection measures according to the monitored results.

3.5 Mitigation measures for social environmental impact

3.5.1 Design stage

(1) In route selection, interchange setting-up, environmental protection, removal and resettlement, consultations have been made with along-the-route governments, related departments, NGOs, villagers' committees, collective units and even individuals for soliciting their suggestions and for gaining public support to this project implementation.

(2) It is suggested that during the construction drawing design stage, suggestions from local governments at all levels along the route are further solicited with attention paid to public participation. On the basis of full justification of reclaiming earth borrow pits and waste banks, their locations, quantity and borrowing and disposal methods shall be determined rationally.

(3) It is suggested to further optimize alignment design, to determine rational earth borrowing and waste volumes by earth/stone works balance calculation, and to optimize afforestation design so as to make it in close harmony with peripheral natural and human landscape and to highlight local characteristics.

(4) The contract signed between the owner and contractors should define contractor's responsibility and obligation to protect the environment. The contractor shall set up complaint telephone for environmental protection in construction site. For complaints the owner should contact local environmental protection department in time in order to deal with various kinds of environmental disputes promptly.

(5) It is to entrust Jiangxi Provincial Cultural Relic Bureau and Jiangxi Provincial Cultural Relic Institute to carry out cultural relic reconnaissance along the route and to submit cultural relic investigation report. For details see the cultural relic investigation report of this project.

(6) The design for this project has always emphasized a principle of averting villages and small towns with least farmland occupation and removal. Immigrant resettlement offices are established in each level, the 《Resettlement Action Plan》 (RAP) was formulated, and independent supervising organization was hired. For concrete contents, see the
《Resettlement Action Plan》 (RAP).

3.5.2 Construction stage

(1) Effective means shall be used to further publicize the importance of this project and relevant policies and regulations concerning removal and resettlement issues so that local people support the construction of this project.

(2) Rely on local governments to do good job in land acquisition. Compensation fee shall be paid rationally so as to safeguard the people’s legitimate interests and to guarantee that the number of households whose lands are to be acquired and who are to be removed and resettled is a minimum, and to guarantee that their living standard is not lower than the level before this project construction.

(3) Septic tank and dustbin shall be set up in construction campsite and construction unit is responsible for removing and clearing the garbage and septic tank on time to prevent disease from breakout; epidemic prevention shall be well carried out by regularly killing harmful organisms such as the mouse, fly, mosquito, cockroach, etc.

(4) Contractors must provide workers with helmets and earplugs according to labor protection regulations, and must check workers’ health condition; construction sites must be staffed with professional medical worker to provide medical service to the workers, and the medical workers must educate the construction workers on hygiene knowledge periodically. The drinking water in construction site should meet the national sanitary standard for drinking water. Personnel engaged in catering must obtain the hygiene license, and shall receive physical examination regularly;

(5) Construction sign boards shall be hung at construction site, indicating the project name, project responsible person name, builder's license and complaint telephone number, etc., so as to receive supervision from various circles of society and the local people; the construction unit should assign 1-2 full-time environmental protection personnel to be responsible for environmental management.

(6) In order to restore the natural landscape along the route and to highlight the viewsight of modernized highway, when the proposed project is completed, all unnecessary and temporary works influencing the landscape should be removed in time, the material stock grounds and mixing stations shall be cleared up, the construction waste materials and sewage garbage shall be handled properly, the vegetation destroyed by the temporary works should be restored as much as possible. If the detour roads have value of utilization, local government can be consulted to clear and repair them before put into operation, at the same time the roadside shall be afforested and planted with trees to restore the landscape environment.

(7) Local public security department and transportation management department shall be coordinated and cooperated with so as to mobilize traffic jam in time, to deal with traffic accident, and to ensure unblocked transportation.
In order to guarantee noncongestion of the original roads, in intersection points of the highway with these roads, detour roads need to be set up. Such detours roads must be located in one side of the original road, and after the intersection bridge is open to traffic, the detour road will be built into highway subgrade.

In conspicuous place of construction site, telephone number for environmental complaint will be posted for complaint; the owner and contractors must immediately contact with local environmental protection department and solve the dispute within 48 hours.

During construction, if unexplored underground historical relics are found, then construction shall stop immediately, supervising engineer shall protect the site, local historical relic department shall be notified to deal with.

3.5.3 Operation stage

(1) The management organization of this proposed highway should conduct good transportation safety precaution and publicity works so as to ensure smooth highway operation and people’s life ad property safety.

(2) To do good work in environmental construction and maintenance so as to keep the highway in harmony with surrounding environment and to eliminate people’s psychological pressure imposed by the segregation and operation of the highway.

(3) To enhance management over the main line so as to ensure smooth operation and to provide convenience to people’s journey and work.

(4) Because construction and operation of the proposed highway will make the value of land along it appreciating which will result in emergence of new industrial belt and commercial belt, the non-agricultural lands such as lands for industry, commerce and transportation will increase, in order not to lose too many precious cultivating resource, land management department should enhance the approval and management on lands along the route used for various kinds of construction purposes.

3.6 Hazardous cargo transportation management and prevention measures

3.6.1 Design stage

(1) To design closed perfect drainage system which lead the bridge runoff into subgrade drainage ditch so as to prevent hazardous substances on bridge from leaking into the rivers.

(2) In the entrances and exits of super-large bridges, large bridges and long tunnels, to set up warning signs “Cautious Drive” (yellow) and “Speed limit 60km for hazardous cargo vehicles (red)” respectively so as to remind the drivers to be careful of safety and speed control.

(3) At 100m in front of each tollgate station, to set up “Attention Sign” (blue) to remind the drivers of hazardous cargo vehicles to drive aside, to declare and to wait for inspection voluntarily.

(1) Tunnel safety design
① To set up management facilities for tunnel operation and to install relevant equipment

Tunnel operation management facilities is composed of 8 systems such as ventilating system, power supply and illumination system, fire-fighting system, traffic control system, urgent telephone system, closed-circuit TV system, fire warning system and central control system. Among them, the ventilating system is composed of booster air blower, air blower driving cabin, carbon monoxide monitor and visibility monitor; the fire-fighting system is composed of fire hydrant case and chemical fire extinguisher; the fire warning system sets up alarm button.

Tunnel ventilation adopts vertical ventilation method by booster air blower with two booster air blowers in one group, each equipped with a control device.

Fire fighting water adopts underground water, lifted to impounding pond by deep-water pump and supplied by fire fighting pump at the time of fire.

② Tunnels should set up an emergency parking strip in the middle with good surrounding rock condition, and correspondingly one transverse gallery for cars and two transverse galleries for pedestrians in interval.

③ To set up special-purpose signs to remind the drivers to pay attention to safe driving.

3.6.2 Hazardous substance transportation management measures during operation stage

In order to guarantee transportation security of hazardous cargo, the country and related departments have already formulated relevant regulations as follows, mainly they are:

(1) 《Safe Management Regulation for Chemical Hazardous Cargo》. State Council;

(2) 《Automobile Transportation Regulations for Hazardous Cargo》 (JT617-2004)

(3) 《Operational Procedure for Hazardous Cargo Automobile Transportation and Loading/unloading》 (JT618-2004)

(4) 《People's Republic of China Law on Gun Management》

(5) 《People's Republic of China Regulations on Civil Explosive Management》

(6) 《People's Republic of China Regulations on Radio Isotope and Radioactive Device Management》

(7) 《Regulation on Hazardous Cargo Transportation》 Ministry of Railways

(8) 《Jiangxi Province Highway Administration Management Method on Hazardous Cargo Transport》

According to the above relevant regulations, the current Chinese hazardous cargo transportation management mode is as follows:

(1) The prefectural and municipal transportation bureaus set up dispatch and shipping agency network for chemical hazardous cargo transport in respective areas.
Local transportation bureaus issue qualificational authentication to the shipping agencies and carrier units. Each shipping agency and carrier unit engaged in the production, sale, storage, and foreign trade of hazardous chemical goods should submit transport plan and relevant report forms to the local transportation bureaus.

Chemical hazardous cargo transportation implements the system of “cargo license”, “driver license” and “guardian license”. All vehicles engaged in hazardous chemical cargo transportation should use unified special-purpose sign and shall be inspected regularly in fixed places, relevant personnel shall be trained and certified.

Public security, transportation management and fire fighting departments shall designate driving route to vehicles transporting hazardous cargo. The vehicles transporting chemical hazardous cargo must be parked in designated parking lot.

Vehicles engaged in long-distance hazardous cargo transportation must use unified waybill with special mark. Each public security and traffic inspection station are responsible for supervising and inspecting.

As far as this project is concerned, the following management measures for hazardous substance transportation are enforced:

1. Declare management system is enforced for vehicles transporting hazardous cargo. The driver (owner) needs to fill in a declaration form indicating the hazardous cargo license number, goods variety/grade/serial number, names of receiver and dispatcher, loading/unloading place, and cargo characteristic, etc.

2. In ultra-wide lane of highway entrance and exit, the three licenses shall be checked for completeness, after proved to be satisfactory, vehicles are allowed to go.

3. Generally vehicles transporting hazardous cargo shall be arranged to pass through in a period with less traffic volume (such as 12:30 - 15:00). Under bad climate condition, they are forbidden to go on the highway.

4. On highway entrance and exit, drivers are distributed with the Safe Driving Guide for Ailing-Ruijin Highway which will be compiled by transportation security experts and which will contain accident emergency treatment method, contact telephone number and mailing address of safety commission, etc.

5. Declaration and checking of hazardous cargo transporting vehicles on highway entrance and exit will be carried out by fee-collectors in tollgates. Relevant staff members shall be trained on hazardous cargo vehicle management method, declaration, safety inspection, workflow and fire fighting, which will be included in the training plan of the project.

6. When hazardous cargo vehicles loading detonator and explosive need to pass tunnels, the staff members of tollgate stations shall notify tunnel management staff in time who will send special personnel to escort the vehicles to pass the tunnel.
3.6.3 Possibility analysis of inspecting hazardous cargo vehicle in tollgate

The hazardous cargo automobile transportation in China strictly observes the 《Automobile Transportation Regulations for Hazardous Cargo》 (JT617-2004) and the 《Operational Procedure for Hazardous Cargo Automobile Transportation and Loading/unloading》 (JT618-2004) issued by Ministry of Communications of the People's Republic of China, which stipulate detailed regulations on hazardous cargo classification, packaging and sign, vehicle and equipment, consignment and documentation, shipping and receipt, transporting and loading/unloading, custody and fire fighting, supervising and management, etc. Vehicles transporting hazardous cargo need to register with transportation authority and to receive supervision and management from the transportation authorities of all levels. The vehicles need to stop and pay for toll while entering the expressway. In 100 m in front of tollgate there is an indication board (blue) reminding hazardous cargo vehicle’s driver to step aside and to voluntarily declare and receive inspection. In the outmost side of tollgate there is ultra-wide lane for ultra-wide vehicle and hazardous cargo vehicle to use. In addition, the hazardous cargo vehicle shall hang a signal flag with black word “hazardous cargo” in yellow background in the left front, also the driver can remind the fee-collector to inspect the hazardous cargo vehicle.

3.6.4 Tunnel pollution risk prevention

⑴ Tunnel management station is in charge of the daily maintenance, repair and emergency rescue so as to guarantee the normal work of ventilating, lighting, fire reporting, fire control, closed-circuit TV, emergency call, signal lamp, etc., and to control them.

⑵ Tunnel management staff shall be trained, which will be incorporated into the training plan so as to improve their ability and management level to handle accident.

⑶ Air quality in the tunnel shall be monitored, which will be included in the environmental monitoring plan and the monitoring data will be reported in time.

⑷ To strengthen management over hazardous cargo transportation

① To enforce declaration system;
② To enforce sample-check system;
③ Under unfavorable climatic conditions, hazardous cargo transportation vehicles are forbidden to enter tunnel.

The above-mentioned two activities ② and ③ are implemented by tunnel management staff.

3.6.5 Hazardous substance traffic accident emergency plan

⑴ In case accident happens, any person who discovers should immediately report to the central control room through roadside emergency call or other communication means.

⑵ After receiving the accident report, the central control room should immediately notify nearby highway policemen to go to the accident site to control the site; meanwhile, local fire
department shall be notified who shall send fire-fighting vehicles and firemen to rescue.

(3) If the hazardous cargo is solid, they can be cleaned and handled, and the accident shall be recorded in file.

(4) If the hazardous cargo is gaseous and highly toxic, firemen should wear gas mask to deal with; In case that the hazardous cargo will leak unavoidably, local environmental protection department and public security department shall be notified immediately, and when necessary, people in the pollution range along the route shall be evacuated to avoid poisoning, injuries and deaths.

(5) If the hazardous cargo is of liquid state, and has already entered public water body, local environmental protection department should be notified immediately. The environmental protection department should immediately notify downstream units to stop fetching water, and at the same time shall send environmental experts and monitoring personnel to monitor the site and to salvage in time the hazardous cargo container which falls into the water body.

3.6.6 Analysis of accident emergency ability

(1) In order to guarantee traffic safety in tunnels under daily normal and emergency conditions, in order to react promptly and handle fires and other emergency accidents, in order to eliminate or reduce accident pollution risk and danger, the tunnels, in addition to be installed with necessary ventilation and lighting facilities, shall also be set up with closed-circuit TV monitor, fire reporting and emergency calling, fire control facilities, etc. The monitoring system of tunnel management station is made up of computer network, closed-circuit TV monitoring system and comprehensive control panel.

(2) The tunnel monitoring scheme covers three cases: normal, fire and traffic accident, according to which, programs on ventilation control, illumination control and traffic control are formulated.

(3) The operation of the expressway (including the tunnels) is under monitor all the time. In case of accident, it can be known at first time, and the first-aid rescue organization, fire control department, environmental protection department, and traffic police, etc., can be notified in time for rescue, fire fighting, traffic evacuation and environmental monitoring. Fire fighting and injury/death first-aid will be handled by nearby departments. The highway management department needs to establish connection with fire fighting and medical organizations along the route and shall provide telecommunication means.

(4) In order to strengthen the ability to deal with hazardous cargo traffic accident, it is suggested that the Jiangxi Provincial Communications Department Project Office convene meetings, share experience and carry out training so as to improve the ability to deal with similar accidents. Equipment damaged in accident shall be maintained, repaired, installed and calibrated in time so as to put into operation as soon as possible.

In sum, it can be thought that this project has relatively strong emergency ability handling
traffic accidents.

3.7 Environmental protection measures for roadbuilding materials and transportation

(1) The quarry contractors must observe the security regulations on outdoor blasting to confirm ignite time which should avoid work peak hour; the contractors must conscientiously protect worker's personal security, must provide helmet, earplug, etc., to workers according to relevant labor protection regulations, and provide regular physical examination to them.

(2) For the soil erosion caused by stone quarries, management must be strengthened to formulate excavation plan so as to control the vegetation damage and soil erosion in stone quarries to the minimum.

(3) Transport vehicle should observe local traffic regulations, overloading is forbidden to prevent bulk stones or other roadbuilding materials from falling and halting the traffic. Transportation department is responsible for such inspection.

(4) Detour roads should be sprinkled by water regularly. Vehicles hauling roadbuilding materials which are easy to lose shall be covered by fluffy cloth.

(5) The contractors shall well prepare transportation plan so as to avoid hauling materials in peak hours.

(6) It is required to rationally choose roads for transporting stones so as to avoid dense residences and schools as much as possible. When there is residential area 50 meters within the transporting road, such stone transportation is forbidden at night (22: 00- 6. 00 next day). Meanwhile, blasting is forbidden at night.

(7) In daytime, if noise interference is produced in schools and residential areas near detour road, movable sound barriers can be set up to mitigate the noise impact.

(8) To strengthen transportation management of National Road 323. The contractor is required to do a good job in vehicle maintenance so as to make the noise level of the vehicles at a minimum level.

(9) The supervising engineer is required to strengthen noise monitoring. If materials transportation makes the acoustic environmental quality of residential areas along National Road 323 worsening, the hauling route can be considered to change, or some economic compensation can be made with agreement from local residents.
4 Executing organization for environmental management and its duties

4.1 Executing organization for environmental management

The environmental management of the proposed project is in the charge of Jiangxi Provincial Communication Department for organization and implementation, the Jiangxi Provincial Communication Department World Bank Loan Project Office is responsible for the environmental management for this project. The environmental management organizations for this project during construction and operation stages are shown in Fig. 4.1-1 and Fig. 4.1-2.

Fig. 4.1-1 Environmental management organization during construction stage

Fig. 4.1-2 Environmental management organization during operation stage

The environmental protection office of Ministry of Communications is responsible for
coordinating the environmental protection work of the transportation sector in unison.

The Jiangxi Provincial Communication Department Planning Office is also responsible for environmental management function for transportation circle in the entire province, by formulating environmental protection management method and regulation, compiling environmental protection plan and supervising its implementation in this province.

### 4.2 Environmental management plan

The following environmental management plan is formulated (Table 4.2-1). Table 4.2-2 presents the Key EMP factors of the proposed highway.
Table 4.2-1 Environmental management plan for this project

<table>
<thead>
<tr>
<th>Potential environmental impact</th>
<th>Mitigation measures</th>
<th>Implementing organization</th>
<th>Responsible organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Planning and designing stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Reduced floodwater discharge ability</td>
<td>1. To design meticulously</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>2. Migration and forced resettlement of residents in road right-of-way</td>
<td>2. To formulate and carry out just and proper resettlement plan and to compensate for</td>
<td>Local government</td>
<td></td>
</tr>
<tr>
<td>3. Loss of land resource</td>
<td>3. To occupy as few lands(good farmland) as possible</td>
<td>Design unit</td>
<td></td>
</tr>
<tr>
<td>4. Loss of environmental beautification</td>
<td>4. To meticulously design so as to make it in harmony with landform (landscape)</td>
<td>Design unit</td>
<td></td>
</tr>
<tr>
<td>5. Blocked way from house to farmland, increased walking time</td>
<td>5. To provide suitable number of passageways in suitable locations</td>
<td>Design unit</td>
<td></td>
</tr>
<tr>
<td>6. Soil erosion caused by open or blind drainage ditches on the soil lower than subgrade</td>
<td>6. To increase number of water outlet, to set up good outlet in order to avoid cascade effects</td>
<td>Design unit</td>
<td></td>
</tr>
<tr>
<td>7. Road runoff pollution</td>
<td>7. To make the road runoff not enter into water source/farmland irrigation directly</td>
<td>Design unit</td>
<td></td>
</tr>
<tr>
<td>II. Construction stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Increased river sediment due to erosion in construction site, road cutting and waste disposal</td>
<td>1. To use coverings or fiber to protect sensitive surface, to plant reliable plants as soon as possible.</td>
<td>Contractors</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>2. Oil/engine oil/fuel and paint’s pollution to soil and water produced in equipment ground and bituminous mixing station</td>
<td>2. To collect recycled lubricant, to prevent accidental spillover by good operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ambient air pollution in bituminous mixing station/stabilizing soil mixing station</td>
<td>3. To install and open air pollution control devices, to choose suitable place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Dust, noise and air pollution in construction site</td>
<td>4. To regularly sprinkle water on temporary road, to install silencer on equipment and to maintain in time.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Local government

Jiangxi Provincial Expressways Administration

World Bank Loan Project Office
5. Unexplored underground historical relics found during construction
6. Landform disruption produced from embankment/fill and stone production
7. Interference to facilities along the highway (electricity/ telecommunication, etc.)
8. Existing road driving conditions impacted during construction.
9. Formidable sewage facilities and solid waste in construction site
10. Possible infectious disease dissemination among workers and local people.
11. Temporary germ (mosquito) breeding habitat produced such as stagnant pool on sunny side.
12. Influence to land yield produced by large earth borrowing

III. Operation stage
1. Ambient air pollution and noise pollution produced by vehicle driving.
2. Persistent soil erosion
3. Highway runoff pollution
4. Sewage and oil-containing waste water pollution in parking lots and management stations

| 5. To stop construction and to notify historical relics administrative department for protection |
| 6. To make it integrated into landform (landscape) through design, to repair the broken earth surface |
| 7. To sign agreement with related departments, to relocate after being first open so as to reduce impacts |
| 8. To strengthen traffic administration in possible traffic conflict points. |
| 9. To provide suitable lavatory and dustbin, to strengthen environmental management. |
| 10. To regularly examine workers' health, to handle when needed |
| 11. To adopt necessary measures to avoid producing reproducible place |
| 12. To keep the topsoil and to pile collectively, to level land as soon as possible after construction, and to recover the topsoil so as to shorten temporary land use time |

Jiangxi Provincial Expressways Administration
Jiangxi Provincial Communication Department
Ganzhou Prefecture and Ruijin City environmental monitoring stations
### 5. Disorderly roadside
6. Toxicant spillover/injury or death caused by accident of vehicle traffic and transportation

<table>
<thead>
<tr>
<th>Environmental problem</th>
<th>Actions taken or to be taken</th>
<th>Implementing organization</th>
<th>Responsible organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Design stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Rout selection</td>
<td>From 2 alternative schemes, the recommended alignment scheme was determined, and in next stage some partial route schemes will be further optimized and compared so as to minimize adverse impacts on environment and society, and similarly also to avoid unfavorable geological conditions and cultural relic sites.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>2. Disturb people</td>
<td>Designed 48 passageways to satisfy traffic demand of inhabitant and vehicles.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>3. Soil erosion</td>
<td>• In side slopes and appropriate roadside places, it is to plant bush, grass as well as to set up retaining walls, catch drains, mortar pitching to prevent soil erosion.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>Environmental problem</td>
<td>Actions taken or to be taken</td>
<td>Implementing organization</td>
<td>Responsible organization</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
<td>• Designed temporary and permanent drainage system, affected irrigation ponds will be dug again to keep soil erosion and influence on water conservation dam to smallest. &lt;br&gt; • Designed protection works for 5 earth borrow pits and 3 waste banks.</td>
<td></td>
<td>Department</td>
</tr>
<tr>
<td>4. Dust/air pollution</td>
<td>Except for the actions in item “1”, earth borrow pits, material yards, waste banks, stabilizing earth mixing station and asphalt mixing station have been identified the necessity to consider dust pollution on residences and educational and cultural units.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>5. Water pollution</td>
<td>The tollgates and parking lot and other facilities have designed sewage treatment facility to make the waste water discharged into public water body after satisfying designated standard.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>6. Noise</td>
<td>Except for the actions in item “1”, sufficient measures such as removal and sound barrier have been confirmed and incorporated into the design and tender documents.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>7. Cultural relics</td>
<td>Carried out cultural relic investigation, under progress now.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Cultural Relics Administration</td>
</tr>
<tr>
<td>8. Flood</td>
<td>Bridge and culvert have undertaken sufficient design so as to satisfy flood discharge requirement (1/300 years for large bridge, 1/100 years for others).</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>9. Hazardous cargo transport</td>
<td>Drainage system has been designed, contingency plan has been formulated so as to prevent impact on water body because of hazardous cargo transportation accident.</td>
<td>Design unit</td>
<td>Jiangxi Provincial Communication Department</td>
</tr>
<tr>
<td>B. Constructi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental problem</td>
<td>Actions taken or to be taken</td>
<td>Implementing organization</td>
<td>Responsible organization</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>on stage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1. Dust/air pollution | • During construction period water will be sprayed, especially on stabilizing earth mixing station and asphalt concrete mixing station and detour road. When filling subgrade, water will be sprayed to compact the material, after material compaction, water will be sprayed regularly to prevent dusting.  
• Warehouses and stock grounds will be covered, unless the material is used immediately.  
• Vehicles transporting roadbuilding materials must also be covered to reduce spillage and fall.  
• Stabilizing earth mixing station and asphalt concrete mixing station must be at least 300m leeward from residences.  
• Mixing equipment must have good sealing and the vibrators must be installed with dust removal device, the workers shall pay attention to labor protection. | Contractor | Jiangxi Provincial Expressways Administration |
| 2. Soil erosion/water pollution | • In suitable places such as side slope and roadside, trees and grass will be planted, especially on high-fill and deep-cut section, stone walls will be covered and grass will be planted.  
• If existing irrigation, drainage system or pond is damaged, they will be rebuilt or reconstructed.  
• When lime and other easily flying materials are piled together, they will be fenced by brick or earth walls and be kept from water body.  
• In constructing permanent drainage system, temporary canals and culverts will be constructed for irrigation and drainage.  
• All necessary measures will be taken to prevent the earth ad stone from blocking river and canal course or current irrigation and drainage system.  
• All reasonable measures will be taken to prevent the waste water produced in construction from entering into river courses and irrigation canals directly. | Contractor | Jiangxi Provincial Expressways Administration |
<p>| 3. Construction | • Garbage can and sanitary disposal facility will be provided in construction campsites, and will be | Contractor | Jiangxi Provincial Expressways |
|                      |                             |                           |                          |</p>
<table>
<thead>
<tr>
<th>Environmental problem</th>
<th>Actions taken or to be taken</th>
<th>Implementing organization</th>
<th>Responsible organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campsite</td>
<td>cleaned up regularly.</td>
<td>Administration</td>
<td>World Bank Loan Project Office</td>
</tr>
<tr>
<td></td>
<td>• The drinking water will satisfy Chinese national drinking water standard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hygienic propaganda and education will be regularly educated to the construction workers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Noise</td>
<td>• It is to strictly enforce industrial enterprise noise standard so as to prevent workers from noise damage, the workers close to strong acoustic source will wear ear plug and helmet, and their working duration will be limited.</td>
<td>Contractor</td>
<td>Jiangxi Provincial Expressways Administration</td>
</tr>
<tr>
<td></td>
<td>• When there are large residences 150m within construction site, noisy construction shall not undertake at night (22:00 ~ 6:00).</td>
<td></td>
<td>World Bank Loan Project Office</td>
</tr>
<tr>
<td></td>
<td>• Machinery and vehicle maintenance will be strengthened to keep their noise to a minimum.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If construction machinery noise produces disturbance on schools, mobile sound barrier should be established.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• When there are large-sized residences 50m within detour roads, transportation of construction materials should be forbidden at night on the detour roads.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• In G323 on which construction materials are transported and on residences near detour roads, monitoring points will be set up, and corresponding measures will be taken according to monitored results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Protection of ecological resource</td>
<td>• In order to protect forestland from damaged, earth shall not be borrowed from forestland, and materials shall not be piled and temporary campsite shall not be built in forestland.</td>
<td>Contractor</td>
<td>Jiangxi Provincial Expressways Administration</td>
</tr>
<tr>
<td></td>
<td>• Farmland shall not be used as earth borrowing pits as much as possible, if inevitable, the topsoil (30cm) will be retained, and promptly backfilled.</td>
<td></td>
<td>World Bank Loan Project Office</td>
</tr>
<tr>
<td></td>
<td>• Education on construction workers will be strengthened to protect natural resources and wildlife animals and plants, hunting is strictly forbidden.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Construction vehicles will run on temporary detour roads so as not to damage farmland and vegetation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Accident risk</td>
<td>• In order to guarantee construction security, on temporary roads, effective lighting devices and safety signals will be installed, and at the same time full traffic regulations will be adopted and enforced.</td>
<td>Contractor</td>
<td>Jiangxi Provincial Expressways Administration</td>
</tr>
<tr>
<td></td>
<td>• During construction stage, the blasting time, signal and security guard will be regulated; vehicles in dangerous areas will be immediately dispersed.</td>
<td></td>
<td>World Bank Loan Project Office</td>
</tr>
<tr>
<td></td>
<td>• Before blasting, careful and thorough inspection must be taken.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Safety watchout post will be set up so as to prevent people and vehicles from passing before blasting; during rush peak hours, blasting will not be conducted so as to avoid traffic jam and personnel casualty.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental problem</td>
<td>Actions taken or to be taken</td>
<td>Implementing organization</td>
<td>Responsible organization</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>7. Cultural relics</td>
<td>• Blasting material management and use will strictly follow public security department’s safety requirements.</td>
<td>Contractor</td>
<td>Jiangxi Provincial cultural Relics Administration</td>
</tr>
<tr>
<td></td>
<td>• If there discovered any fossil, ancient coin, architecture or other remains of archaeological and geological value, construction should stop immediately, and such discovery shall be reported to local cultural relic department immediately until authorized protection department completes the cultural relic confirmation.</td>
<td>Jiangxi Provincial Archaeologic al Institute</td>
<td>Jiangxi Provincial Expressways Administration</td>
</tr>
<tr>
<td>8. Traffic and transportation</td>
<td>• Local construction materials shall be used as much as possible so as to avoid long-distance transport of construction materials, especially the earth and stone works.</td>
<td>Contractor</td>
<td>Jiangxi Provincial Expressways Administration</td>
</tr>
<tr>
<td></td>
<td>• When there is traffic jam during construction stage, enough traffic mobilizing measures shall be taken with coordination from transportation and public security departments.</td>
<td>Local transportation bureau, public security and fire bureau, environmental protection bureau, Jiangxi Provincial Expressways Administration</td>
<td>World Bank Loan Project Office</td>
</tr>
<tr>
<td></td>
<td>• In the interchange places of the proposed highway with other roads, temporary access roads will be built.</td>
<td>World Bank Loan Project Office</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Materials can be considered to prepare in advance in seasons with fewer traffic jams (Jan/Feb and Sept/Oct).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• A construction material transportation plan will be formulated to avoid transportation in rush hour, especially on existing roads.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Operation stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Hazardous cargo leakage risk</td>
<td>• Prefectural or municipal transportation departments will set up respective coordinating organizations for chemical hazardous cargo transportation.</td>
<td>Local transportation bureau, public security and fire bureau, environmental protection bureau, Jiangxi Provincial Expressways Administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chemical hazardous cargo transportation implements the system of “cargo license”, “driver license” and “guardian license” issued by transportation department. All vehicles engaged in hazardous chemical freight transportation should use unified special-purpose sign.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Public security, transportation management and fire fighting departments shall designate driving route to vehicles transporting hazardous cargo. The vehicles transporting chemical hazardous cargo must be parked in designated parking lot.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Regarding this project’s hazardous cargo transportation management, the highway administration department will manage through registration system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• In case hazardous cargo leaks, such accident must be reported to concerned departments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental problem</td>
<td>Actions taken or to be taken</td>
<td>Implementing organization</td>
<td>Responsible organization</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>immediately, and must be handled according to formulated emergency plan.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 2. Vehicle management | • It is to strengthen inspection on vehicles noise and exhaust tail gas. If the vehicles noise exceeds the allowed standard or does not comply with discharge standard, they are not allowed to run on the highway.  
  • Announcement and education will be strengthened to the people on relevant laws and regulation concerning vehicle air pollution and noise.  
  • Massive cargo transportation of coal, cement, sand and simply packaged chemical fertilizer and others may possibly spill along the route and pollute the road. Entrance inspection will be strengthened, vehicles that do not have enough measures to prevent such spillage will not be allowed to run on this highway. | Jiangxi Provincial Expressways Administration | Jiangxi Provincial Expressways Administration |
| 3. Noise              | According to monitored results, sound barriers and other noise-reducing measures will be taken in places with serious noise interference.                                                                                                                                  | Jiangxi Provincial Expressways Administration | Jiangxi Provincial Expressways Administration |
| 4. Maintenance of drainage system | Drainage system will be desilted periodically so as to ensure a smooth operation.                                                                                                                                               | Jiangxi Provincial Expressways Administration | Jiangxi Provincial Expressways Administration |
| 5. Other              | Civilian houses are forbidden to build 142m within two sides of the road center line, and schools and hospitals are forbidden to build 332m within two sides of the road center line.                                                                 | Land management department | Land management department                        |
| D. Environmental monitoring |                                                                                                                                                                                                                           |                           |                                                  |
| 1. Ambient air        | (1) Construction stage  
  a. Monitoring item: TSP, bituminous smoke  
  b. Monitoring frequency: once/week, random monitoring  
  c. Monitoring time: 1 day  
  d. Monitoring point: stabilizing earth mixing station, large residence and school near unpaved construction road and bitumen concrete mixing station  
  (2) Operation stage                                                                                                                                 | Local monitoring station   | Supervising company Jiangxi Provincial Expressways Administration |
<p>| | | | |
|                       |                                                                                                                                                                                                                           |                           |                                                  |</p>
<table>
<thead>
<tr>
<th>Environmental problem</th>
<th>Actions taken or to be taken</th>
<th>Implementing organization</th>
<th>Responsible organization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Noise</td>
<td>(1) Monitoring frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Construction stage: once/month, random monitoring if needed</td>
<td>EP supervising engineer or Local monitoring station</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Operation stage: 4 times/year</td>
<td>Supervising company Project Office Jiangxi Provincial Expressways Administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Monitoring time: 2 times in a day</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Monitoring point</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Construction stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Main line of the proposed highway, construction sites 100m within which there are residences or sensitive units</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Operation stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Residences: Dongtouling, Pinghu, Hulipai, Songshanxia, Jiantounao, village 1, Sangongwo, Xinaoxia, Qiganxia, Xiashabei, (Xiashebei, Shangshebei, Shaba), and village 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Water quality</td>
<td>(1) Construction stage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Monitoring item: pH, COD&lt;sub&gt;C&lt;/sub&gt;, SS, petroleum</td>
<td>Local monitoring station</td>
<td>Supervising company Project Office Jiangxi Provincial Expressways Administration</td>
</tr>
<tr>
<td></td>
<td>b. Monitoring frequency: depends on actual needs of construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Monitoring time: 1 day</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Monitoring point: 100m upstream and 200m downstream the bridge site of Mianjiang river super-large bridge (K6 +270)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Environmental Management Plan for Ailing-Ruijin Highway

<table>
<thead>
<tr>
<th>Environmental problem</th>
<th>Actions taken or to be taken</th>
<th>Implementing organization</th>
<th>Responsible organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) Operation stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Monitoring item:</td>
<td>pH, COD&lt;sub&gt;Cr&lt;/sub&gt;, SS, petroleum, grease, TP, TN, BOD&lt;sub&gt;5&lt;/sub&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Monitoring frequency:</td>
<td>2 times/year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Monitoring time:</td>
<td>2 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Monitoring point:</td>
<td>Ruijin parking lot, 50m downstream Mianjiang river super-large bridge (K132+165)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.3 Supervising organization

The environmental protection works of this project are subject to supervision from China National Environmental Protection Agency, Jiangxi provincial Environmental Protection Agency, municipal(county) environmental protection departments along the route. This project’s environmental management and supervision plans are shown in Table 4.3-1.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Organization</th>
<th>Supervision contents</th>
<th>Supervision purposes</th>
</tr>
</thead>
</table>
| Feasibility study      | China National Environmental Protection Agency, Jiangxi Provincial Environmental Protection Agency | 1. To review EIA report  
2. To review EMP (Environmental Management Plan) draft. | 1. To guarantee that the EIA contents are complete, topic identification is appropriate, the key points are highlighted.  
2. To guarantee that the great potential problems produced by this project have been already reflected.  
3. To guarantee that the mitigation measures are specific and feasible. |
| Design and construction stage | World Bank China National Environmental Protection Agency, Jiangxi Provincial Environmental Protection Agency | 1. To review preliminary design for environmental protection and EMP | 1. To strictly enforce “Three simultaneousness” and the environmental protection measures promised in EMP. |
|                        | World Bank China National Environmental Protection Agency | 2. To make sure whether the environmental protection investment is finalized | 2. To guarantee the environmental protection investment is available in full sum |
|                        | Jiangxi Provincial Environmental Protection Agency, Prefectural, municipal and county environmental protection bureaus | 3. To inspect whether the locations of stock grounds, concrete mixing station, stabilizing soil mixing station and bituminous mixing station are reasonable | 3. To guarantee these stations meet environmental protection requirements |
|                        |                                                                 | 4. To inspect dust and noise pollution, to determine construction time | 4. To reduce impacts on surrounding environment caused by engineering construction, to enforce relevant laws, regulations and standards of environmental protection |
| Operation stage | Jiangxi Provincial Environmental Protection Agency | 1. To inspect the implementation of EMP (environmental management plan) during operation stage.  
2. To inspect the implementation of environmental monitoring plan.  
3. To inspect whether it is necessary to take further environmental protection measures (environmental problems not estimated originally may occur) | 1. To finalize the environmental requirements proposed in EMP.  
2. To finalize the implement contents of the environmental monitoring plan.  
3. To protect the environment conscientiously so as to minimize the impacts on environment caused by the project construction and operation. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Jiangxi Provincial Environmental Protection Agency</td>
<td>5. To inspect whether the management methods and measures for loading/unloading and piling poisonous, harmful substances are applicable or not, to inspect whether the air pollutant discharge satisfies the corresponding discharge standard</td>
<td>5. To reduce impacts on surrounding environment caused by engineering construction, to enforce relevant laws, regulations and standards of environmental protection</td>
</tr>
<tr>
<td>Jiangxi Provincial Environmental Protection Agency</td>
<td>6. To inspect whether the discharge and treatment method of sewage and engine oil in the construction site are suitable or not</td>
<td>6. To guarantee surface water not contaminated</td>
</tr>
<tr>
<td>Jiangxi Provincial Environmental Protection Agency</td>
<td>7. To restore and handle earth borrow pits and waste banks</td>
<td>7. To guarantee that the landscape and land resources are restored as soon as possible</td>
</tr>
<tr>
<td>Jiangxi Provincial Environmental Protection Agency</td>
<td>8. To inspect the “Three simultaneousness” of environmental protection facilities, to determine final completion time</td>
<td>8. To guarantee the “Three simultaneousness” of environmental protection facilities</td>
</tr>
<tr>
<td>Jiangxi Provincial Environmental Protection Agency</td>
<td>9. To inspect whether the environmental protection facilities meet design standard</td>
<td>9. To accept environmental protection facilities</td>
</tr>
<tr>
<td>Jiangxi Provincial Environmental Protection Agency</td>
<td>10. To inspect whether there are underground relics</td>
<td>10. To guarantee that relics are not damaged</td>
</tr>
</tbody>
</table>
| China National Environmental Protection Agency | To finalize the environmental requirements proposed in EMP.  
2. To finalize the implement contents of the environmental monitoring plan.  
3. To protect the environment conscientiously so as to minimize the impacts on environment caused by the project construction and operation. | 1. To inspect the implementation of EMP (environmental management plan) during operation stage.  
2. To inspect the implementation of environmental monitoring plan.  
3. To inspect whether it is necessary to take further environmental protection measures (environmental problems not estimated originally may occur) |
<table>
<thead>
<tr>
<th>Agency</th>
<th>Responsibilities</th>
</tr>
</thead>
</table>
| Jiangxi Provincial Environmental Protection Agency Prefectural, municipal and county environmental protection bureaus | 4. To inspect whether the environmental quality of environmental sensitive locations meets their corresponding quality requirement.  
5. To inspect whether the sewage disposal of parking lot is up to discharge standard.  
6. To inspect whether the road surface water is entered into drinking water source. |
| Jiangxi Provincial Environmental Protection Agency Public security department and fire-fighting department | 4. To strengthen environmental management, to protect people’s life quality conscientiously.  
5. To guarantee the sewage discharge meet standard requirement.  
6. To guarantee drinking water source not polluted.  
7. To strengthen supervision to prevent emergency accident, to eliminate accident-hidden danger. To formulate in advance urgent accident handling plan so as to eliminate dangers in time in case of accident and to ensure hypertoxic material is not leaked in the accident.  
7. To eliminate accident hidden danger to avoid fatal pollution accident. |
5  Environmental monitoring plan and environmental standard threshold value

5.1 Environmental monitoring plan

(1) Formulation purpose and principle

The purpose to formulate environmental monitoring plan is to supervise the implementation of each measure in order to adjust the environmental action plan in good time according to the result of monitoring and to provide the basis for the implementation time and scheme of environmental protection measures. The principle is to follow the anticipated main environmental impacts of each period (construction or operation stage).

(2) Monitoring items

According to the anticipated environmental impact analysis and assessment results, the monitoring items during construction stage are identified as TSP, bituminous smoke, construction noise and water quality; the monitoring items during operation stage are identified as traffic noise, ambient air, water environment.

(3) Environmental monitoring organization

It is more convenient for the noise monitoring during construction stage to be carried out by supervising engineer. Other monitoring can be entrusted to local environmental monitoring stations. The construction unit should sign monitoring contract during construction stage with the monitoring stations before constructing, and sign monitoring contract during operation stage with the monitoring stations before the project is made available to the users.

(4) Environmental monitoring plan

The environmental monitoring plan for this project is shown in Table 4.2-2.

(5) Monitoring equipment purchase and monitoring cost

This project intends to purchase 2 noise measuring meters with estimated cost of about 40,000 yuan.

The monitor cost during construction stage for this project is estimated to be 225,000 yuan, that of during operation stage is 180,000 yuan. The total monitoring cost for this project is 405,000 yuan.

(6) Monitoring report system

The monitoring report system is illustrated in Fig.5.1-1. After each monitoring, the monitoring unit should submit a monitoring report to higher organizations in a hierarchical manner. Jiangxi Provincial Expressways Administration should submit environmental monitoring plan to Jiangxi Provincial Environmental Protection Agency once in every quarter during construction stage and
Environmental standard threshold value

5.2.1 Water environment

Surface water quality assessment along the route enforces the class III criteria of the *Surface Water Environmental Quality Standard* (GB3838-2002); irrigation water enforces class 1 criteria of *Farmland Irrigation Water Quality Standard* (GB5084-92); Sewage discharge enforces class 1 criteria of *Sewage Comprehensive Discharge Standard* (GB8978-1996). Specific indexes refer to Table 5.2.1-1.
Table 5.2.1-1 Water quality assessment standards (excerpt)

<table>
<thead>
<tr>
<th>Assessment standards</th>
<th>pH</th>
<th>Petroleum (mg/L)</th>
<th>Ammonia nitrogen (mg/L)</th>
<th>Biochemical oxygen demand (mg/L)</th>
<th>Chemical oxygen demand (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>《Surface Water Environmental Quality Standard》 (GB3838-2002)</td>
<td>Class III</td>
<td>6~9</td>
<td>≤0.05</td>
<td>≤1.0</td>
<td>≤4</td>
</tr>
<tr>
<td>《Farmland Irrigation Water Quality Standard》 (GB5084-92)</td>
<td>Class I</td>
<td>5.5~8.5</td>
<td>≤5</td>
<td>--</td>
<td>≤80</td>
</tr>
<tr>
<td>《Sewage Comprehensive Discharge Standard》 (GB8978—1996)</td>
<td>Class I</td>
<td>6~9</td>
<td>≤5</td>
<td>≤15.0</td>
<td>≤20</td>
</tr>
</tbody>
</table>

5.2.2 Assessment standard for acoustic environment

According to investigation, the road mostly runs through rural areas without acoustic environmental functional zoning, the current acoustic environmental assessment enforces the class I criteria of 《Urban Ambient Noise Standard》 (GB3096-93) ; It is to enforce the 《Construction Boundary Noise Level Limit》 (GB12523-90 ) during construction stage (see Table 5.2.2-1); during operation stage, it is to enforce the 《Notice about Ambient Noise in Environmental Impact Assessment in Construction Projects such as Highway, Railway (Including Light Railway)》 (environment (2003) No 94) , that is: urban areas that have been classified in acoustic environmental function zoning enforce GB3096-93; urban areas that have not been classified in acoustic environmental function zoning enforce appropriate standards confirmed by local governments above county level; village residential areas, schools and other sensitive buildings within assessment scope enforce class 2 criteria(those within class 1 criteria enforces class 1 criteria).; for other sensitive locations, the following criteria will be enforced: areas 50m within the line of right-of-way enforce class 4 criteria, areas 50m from the line of right-of-way enforce class 1 criteria (see Table 5.2.2-2).
Table 5.2.2-1 《Construction Boundary Noise Level Limit》 (GB12523-90) (excerpt)

<table>
<thead>
<tr>
<th>Construction stage</th>
<th>Main noise source</th>
<th>Daytime</th>
<th>Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth/stone works</td>
<td>Bulldozer, excavator, loader, etc</td>
<td>75</td>
<td>55</td>
</tr>
<tr>
<td>Piling</td>
<td>Various pilers</td>
<td>85</td>
<td>Forbidden</td>
</tr>
<tr>
<td>Structure</td>
<td>Concrete mixer, vibrator and electric saw, etc</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td>Decoration</td>
<td>Crane and elevator, etc</td>
<td>65</td>
<td>55</td>
</tr>
</tbody>
</table>

Table 5.2.2-2  Acoustic environmental assessment standard value during operation stage

<table>
<thead>
<tr>
<th>Class or sensitive objective</th>
<th>Daytime</th>
<th>Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB3096-93 《Urban Ambient Noise Standard》</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class 1</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Class 2</td>
<td>60</td>
<td>50</td>
</tr>
<tr>
<td>Class 4</td>
<td>70</td>
<td>55</td>
</tr>
</tbody>
</table>

5.2.3 Assessment standard for ambient air

(1) Ambient air quality standard

Ambient air quality enforces class 2 criteria of 《Ambient Air Quality Standard》 (GB3095-1996) (see Table 5.2.3-1 in which NO₂ value is modified according to Environmental Document [2000] No. 1).

(2) Pollutant discharge standard

Bituminous smoke enforces 《Air Pollutant Comprehensive Discharge Standard》 (GB16297-1996), see Table 5.2.3-2.

Table 5.2.3-1 《Ambient Air Quality Standard》 (GB3095-1996) (excerpt)  unit: mg/m³

<table>
<thead>
<tr>
<th>Pollutant name</th>
<th>TSP</th>
<th>NO₂</th>
<th>CO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2 limit values of GB3095-1996 《Ambient Air Quality Standard》</td>
<td>Daily average</td>
<td>0.12</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>1 hour average</td>
<td>0.24</td>
<td>—</td>
</tr>
</tbody>
</table>

Table 5.2.3-2  Bituminous smoke (new pollution source) discharge standard (excerpt)  unit: mg/m³

<table>
<thead>
<tr>
<th>Pollutant name</th>
<th>Standard value</th>
</tr>
</thead>
<tbody>
<tr>
<td>《Air Pollutant Comprehensive Discharge Standard》 (GB16297-1996)</td>
<td>Bituminous smoke maximal allowable discharge concentration</td>
</tr>
<tr>
<td></td>
<td>Construction mixing: 75; melting, dipping: 40</td>
</tr>
</tbody>
</table>
6 Ability development and environmental protection training

In order to strengthen the project organization's environmental managerial ability, it is planned to train relevant personnel with environmental protection, the following environmental protection training plan for the project is formulated (See Table 6-1).

<table>
<thead>
<tr>
<th>No</th>
<th>Trainee</th>
<th>Training content</th>
<th>Time</th>
<th>Place</th>
<th>Size</th>
<th>Cost (yuan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environmental protection supervising engineer</td>
<td>National environmental protection regulations and standards, this project’s main environmental questions, environmental protection supervising engineer’s duty, use of noise monitoring instrument, etc.</td>
<td>Within 2 months before project construction</td>
<td>Nanchang</td>
<td>5 persons, 15 days</td>
<td>25000</td>
</tr>
<tr>
<td>2</td>
<td>Project environmental management personnel</td>
<td>Study the advanced environmental management experience of foreign countries, and apply the knowledge learnt to the environmental management of the project.</td>
<td>From half year to 12 months after project starts construction</td>
<td>Foreign country</td>
<td>2 persons, half month</td>
<td>63000</td>
</tr>
<tr>
<td>3</td>
<td>Contractors’ environmental protection personnel</td>
<td>National environmental protection regulations, standards and this project’s main environmental questions, environmental protection precautions</td>
<td>Within 1 month before project construction</td>
<td>Nanchang</td>
<td>5 persons, 15 days</td>
<td>25000</td>
</tr>
<tr>
<td></td>
<td>Environmental measures during construction, duty of environmental protection staff member.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Relevant national regulations and management rules on hazardous cargo transportation, rudimentary knowledge of hazardous cargo, vehicle declaration and inspection program, emergency plan, fire fighting knowledge.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Within 2 months before project operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nanchang</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All management station staff and tunnel management station staff, 15 days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>18000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7 Implementation progress and cost estimation

7.1 Implementation progress for environmental protection measures

The implementation progress for major environmental protection measures is shown in Table 7.1-1.

<table>
<thead>
<tr>
<th>Items</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Third quarter</td>
<td>Fourth quarter</td>
<td>First quarter</td>
<td>Second quarter</td>
</tr>
<tr>
<td>Removal and land acquisition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sound barrier</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sound-proofing window</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewage treatment facility in tollgate etc.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training of supervising personnel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractors’ environmental protection personnel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training of environmental management personnel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training of accident emergency ability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental protection and management during construction stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Environmental protection and management during operation stage cover the whole operation stage of the highway, including environmental monitoring and maintenance of environmental projects.

7.2 Investment budget for environmental protection

The environmental protection investment budget estimates for the environmental protection measures proposed in this assessment are listed in Table 7.2-1.
<table>
<thead>
<tr>
<th>No</th>
<th>Environmental protection measures</th>
<th>Measure description</th>
<th>Quantity</th>
<th>Unit cost</th>
<th>Amount (10,000 yuan)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Planting and vegetation restoration</td>
<td>Planting in 5 earth borrow pits, 3 waste banks</td>
<td>8 places</td>
<td>100,000 yuan</td>
<td>80.0</td>
<td>Planning cost for side slopes, separators and interchanges is included into the total project cost</td>
</tr>
<tr>
<td>2</td>
<td>Sound barrier</td>
<td>Acoustic environmental protection in Dongtouling, etc</td>
<td>4160 linear meters</td>
<td>2500 yuan/linear meter</td>
<td>1040</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sound-proofing window</td>
<td>Acoustic environmental protection in Xiewu, etc.</td>
<td>338 households</td>
<td>10,000 yuan/household</td>
<td>338</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Environmental protection and management during construction stage</td>
<td>Construction campsite will set up septic tank, garbage pit to clear and deliver the garbage; labor protection for workers and water sprinkling</td>
<td>3 bid sections</td>
<td>300,000 yuan/bid section</td>
<td>90.0</td>
<td>Preliminarily calculated at 3 bid sections</td>
</tr>
<tr>
<td>5</td>
<td>Sewage treatment facility</td>
<td>Sewage treatment in tollgate station, parking lot and management station</td>
<td>7 places</td>
<td>350,000 yuan/place</td>
<td>245.0</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Cultural relics protection</td>
<td>Cultural relics reconnaissance, excavation and tracing</td>
<td></td>
<td></td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Environmental monitoring</td>
<td>Complete the environmental monitoring planning</td>
<td></td>
<td></td>
<td>33.5</td>
<td>Including the monitoring cost for G323 and construction detour roads</td>
</tr>
<tr>
<td>8</td>
<td>Environmental protection training</td>
<td>See environmental protection training planning</td>
<td></td>
<td></td>
<td>13.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equipment purchase</td>
<td>Hand automatic noise measuring meter</td>
<td>2</td>
<td>20,000 yuan each</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------------------</td>
<td>---------------------------------------</td>
<td>---</td>
<td>------------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water sprinkling vehicles</td>
<td>1</td>
<td>200,000 yuan each vehicle</td>
<td>20.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sign board</td>
<td>Careful Driving (yellow), Hazardous Cargo Speed Limit (red) and reminding board (blue)</td>
<td>20</td>
<td>1000 yuan each</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contingency</td>
<td>10% in the above total sum</td>
<td></td>
<td></td>
<td>189.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water conservation</td>
<td>As listed in 《Water conservation scheme》</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>2085.2</td>
<td></td>
</tr>
</tbody>
</table>