World Bank Financed

Shiyan to Manchuanguan Section of

Yinwu Inter-Provincial Highway

Summary Environmental Assessment

Hubei Provincial Communications Department

March 2004
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1 Introduction

This document is the Executive Summary of Environmental Assessment (EA) for the World Bank financed Shiyan to Manchuanguan Section of the Yinwu Inter-Provincial Highway Project (Shiman Highway or the Project). It provides a general summary of the findings in the Project Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP), including legal and policy framework and applicable environmental standards, major potential adverse impacts to the physical and socio-economic environments in the Project area, analysis of alternatives, mitigation measures designed, public consultation programs, and environmental management plan for the Project. The Executive Summary could serve as a concise environmental report to environmental administrators, Project decision makers, project-affected groups, non-government organizations and the general public, as well as to the executive board of directors of the World Bank.

1.1 Project Background

As a section of the Yinwu Inter-provincial Highway, the Project is one of the key infrastructure projects in the Hubei province and a segment in the strategic national trunk highway network. As the expressway will eventually provincial capital of Wuhan at its east end to Yinchuan, the capital city of northwestern province of Ningxia at its west end, Shiman expressway will be a critical link between the more developed central and coastal region with northwestern China and will play an important role in the enormous Develop China’s West program. Within the province, it will form part of the “automobile” corridor, alleviating transportation bottleneck surrounding the fast growing automobile manufacturing industry in northwest Hubei. Together with the connecting road and rural road components also in the same Project region in Hubei province, the Project will be a significant contributor in development of regional economies, improvement of standard of living and alleviation of poverty.

A revised feasibility study for the Project started in mid 2002 and was completed in November 2002. The project preliminary engineering design was completed in November 2003 while the final detailed engineering design is expected to complete in May 2004. Over the same period, Environmental Assessment (EA) for the Project has been conducted by Second Navigation Survey and Design Institute (SNSDI). An EA Terms of Reference (TOR) was compared in August 2002 which was reviewed, revised and approved in December 2002 by the State Environmental Protection Administration (SEPA). The first draft Environmental Impact Assessment (EIA) report was prepared in June 2003 which was reviewed by SEPA and World Bank missions in the second half of 2003 and revised accordingly based on the comments received from the World Bank and SEPA. The final draft of EIA, together with Environmental Management Plan was submitted to the SEPA in December 2003 and on December 26, 2004 reviewed by an expert panel convened by SEPA. Comments received from the panel review have been incorporated into the final EIA report which was submitted to SEPA in January 2004. The official approval of the EA from the SEPA is expected by the end of March, 2004.

The Shiman expressway is classified as a Category A project since it involves major expressway construction on new alignment, grade highway upgrading partially on new alignment, increased noise, motor vehicle air emission, occupation of fertile and barren land, community severance, soil erosion and resettlement.
1.2 Basis of the EA

The regulatory and policy requirements for environmental assessment of development projects in China were followed during the preparation of EA, as were the World Bank's safeguard policies. Major laws and regulations applied to the EA are as follows:

- Laws of Environmental Protection of the P.R. China of December 1989;
- Environmental Impact Assessment Law of P.R. China of October 2002;
- Law of Air Pollution Control of August 2000;
- Law of Water Pollution Control of May 1996;
- Law of Environmental Noise Pollution Control of October 1996;
- Circulation on Strengthening EIA for Construction Projects Receiving International Financing of June 1993; and

Of the ten World Bank safeguard policies, Environmental Assessment (OP/BP/GP4.01), Involuntary Resettlement (OD4.30), Cultural Property (OP4.11), Forestry (OP/GP4.36), Natural Habitats (OP/BP4.04), Pest Management (OP4.09), and Indigenous People (OD4.20) are applied in the EA first through screening and, where triggered, included in the full assessment. Since there are no Project components that would involve international waterways, dams or construction in disputed areas as defined under the World Bank's OP7.60, safeguard policies related to these subjects are not applied in the EA. Relevant international environmental agreements in which China is a signing party have also been included where applicable as a basis for the EA.
2 Project Description

The Project is located in the northwest of Hubei province in central China. The Shiman Expressway starts from Jianinao district of Shiyan city, extends northwest bound through Yun county, Yunxi county and ends at provincial border town of Manchuanguan, Shanyang county in the neighboring Shaanxi province (Map 1). The Project has three major components: the main expressway, connecting roads linking urban centers and rural roads connecting villages with townships and counties. The connecting and rural roads are located within the Shiyan municipality which are the directly impacted/serviced Yun, Yunxi and Zhushan counties (Map 1) which are state and provincial level poverty regions. The expressway will be constructed completely on new alignment, where the connecting roads will partially on new alignment and partially on the existing roads. The rural roads will be primarily on exiting roads, involving hardening/pavement and widening of the existing low grade roads to increase their transportation capacity and all season access.

Key specifications of the components are summarized in Table 2-1.

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<thead>
<tr>
<th>Items</th>
<th>Expressway</th>
<th>Connecting Roads</th>
<th>Rural Roads</th>
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</tr>
<tr>
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<tr>
<td>Capital cost (RMB, million)</td>
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<td>168.45</td>
<td>38.00</td>
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</tbody>
</table>

Figure 1: The Sketch Map of Location of Shiyan to Manchuanqian Project.
3 Baseline Environment

3.1 Physical Setting

The Project area is located in the north semi-tropical region with a continental monsoon climate. The average annual temperature ranges from 11 to 17°C, and average annual precipitation from 696 to 1200 mm. The terrain configuration of the expressway area has a general gradient from northwest to southeast with elevations from 200 to 1200 m. The expressway alignment is in general in the same orientation with the mountain bodies in the area. The Baozhuo rural road is in north-south direction along the river side in general with elevations of 300-950 m. Most sections of the road has mountain on one side and river on the other with 5-30 m differential elevation between the road surface and the river bed. The Jianjunhe river site is a natural river valley of Hanjiang river. On the Yunxi county side of the bridge is mostly steep hill and bare rocks while the Yun county side is basically river sediment delta with relatively flat with sand and gravels.

3.2 Sensitive Receptors

Along the expressway alignment, a total of 23 villages/townships and 10 schools are identified through field investigation as sensitive or otherwise vulnerable to changes in the environment which surrounds them, such as construction activities, air pollution, increased noise, construction dust, etc. These sensitive receptors are located about 30 to 150 m from expressway central line to the nearest points in these sensitive receptors. In addition, the expressway will also cross five rivers and run nearby one dinosaur egg protective area which is a national level reserve (Map 2). Along the connection road, there are two villages and one school while along the rural roads there are nine villages, 11 schools and five hospitals which are sensitive receptors because of their proximity to these Project components.

The sensitive receptors are the focus of the monitoring program for the baseline environmental conditions as well as the environmental impact assessment. They are also the key areas for impact mitigation measures designed to protect or otherwise minimize the adverse impacts at these sensitive locations.

3.3 Air Quality

Existing ambient air quality was monitored during the EA to determine the baseline conditions. The monitoring was conducted near seven selected representative sensitive receptors such as villages and schools between March and April 2003, with five consecutive day continued measurements each time. The representative results of the monitoring at the main expressway and country road are presented in Table 3-1.
The above results show that NO\textsubscript{x} concentrations were between 0.012 to 0.044 mg/m\textsuperscript{3}, below the applicable standard of 0.12 mg/m\textsuperscript{3} (Class II in the Air Quality Standards). The TSP and PM\textsubscript{10} on the road side were between 0.06 to 0.33 mg/m\textsuperscript{3} and 0.03 to 0.16 mg/m\textsuperscript{3}, respectively, slightly higher than their respective applicable standards. The results indicate fairly good existing ambient air quality at the Project areas. The TSP and PM\textsubscript{10} exceedance was mostly along the existing road side which is caused by the existing traffic on these roads.

### 3.4 Noise

Existing noise levels in five sensitive locations along the main expressway and 11 along the rural roads area were measured. The results are presented in Table 3-2.
The above noise monitoring results show that both day and night time noise levels in the areas along the main expressway alignment were below the applicable standards, even reaching Class I standards, showing excellent existing acoustic environment. This is because there are no major noise sources in these areas except farming activities. In the rural road areas, the noise was significantly higher and some were even higher than applicable standards. In the townships, the noise sources include urban activities as well as the traffic. Noise in these areas reached 58.6-63.6 dB(A) for day time and 40.6-51.3 dB(A) at night, exceeding slightly the Class II standards but meeting the Class III standards. The schools along the existing rural roads are mainly impacted by traffic noise. As some of the schools are as close as 5 m to the road side and the road has turns at these locations which cause motor vehicles to brake and horn, the noise level reached as high as 72.5 dB(A) for the day time, significantly exceeded the applicable Class I standards. The two rural villages along the existing road had noise levels of 56.4 and 57.1 dB(A) at day time and 47.9 and 49.6 dB(A) at night respectively meeting Class II standards. The village near the proposed rural bridge site exceeded slightly Class II standards.

### 3.5 Water Quality

Surface water quality at Hanjiang river, which is the largest river to be crossed by the expressway, was monitored on March 5-7, 2003. All monitored data show that measured parameters (pH, COD, Oil, SS and total P) were within their respective applicable standards. Based on historical water quality data and the results of water quality monitoring conducted in April 2003 of Dong, Liayu, Beixing and Jiangjun rivers, which are impacted rivers by the rural road component, except a few exceptions, all water quality parameters met the applicable standards. SS at Beixi river monitoring site exceeded slightly Class II standard.
3.6 Soil Erosion

The primary type of soil erosion in the project area is water and colluvial erosion, particularly surface and ditch erosion, caused by unfavorable land form, topography, geology, soil and hydrology conditions, coupled with disturbance to the surface vegetation without appropriate control. Common forms of soil erosion include movement of surficial materials, ditch failures due to the lack of vegetation, soil dissolution following intense rainfall, and landslides. Soil erosion intensity in the main expressway area is 1874-2139 t/km²a. The rural road area belongs to upper reach of Hanjiang river with severe soil erosion. With nearly 10 years of mountain closure and wood-cutting moratorium, the soil erosion has been gradually under control. The intensity now is 2100-4600 t/km²a while at the Jiangjunhe river bridge site, 3000 t/km²a.

3.7 Cultural Property

A survey by professional archeology, cultural relics institutes and local cultural relics specialists was conducted in January 2001 and again in June 2003, covering the main expressway line, the alternative alignments proposed and evaluated, connecting roads, borrow pits and spoil soil disposal sites. The survey included walk-through of the entire alignment, visual observation and limited sub-surface investigation through drilling and/or sampling. Three cultural relics have been identified, including a Tang-Song Dynasty tomb, a New Stone age tomb and a revolutionary site in the modern history. The later two will be directly or indirectly impacted by the expressway construction due to their close proximity to the alignment.

3.8 Socio-economic Baseline

The total population crossed and serviced by the expressway is approximately 1.69 million and the total serviced area is 112 million mu (15 mu to a hectare), including approximately 1.31 million mu of cultivated land. The major cities/urban centers along the expressway include Shiyancounty, Yun county and Yunxi county, although the expressway will not go through the any of these urban areas directly. The expressway will affect directly 59 villages and townships, 10 schools, five major rivers and many more small rivers, creeks, irrigation channels, and fish/water ponds, because of their proximity to the expressway alignment. It will run adjacent to the state level Qinglongshn dinosaur egg fossil reserve. At its closest point, the expressway alignment will pass an area 140 m to the edge of the experimental zone of the reserve. The rural road area does not have any significant urban centers or reserves.
4 Environmental Impacts

4.1 Soil Erosion

Soil erosion will occur during the Project construction phase when surface vegetation and soil are damaged. The primary area of potentially increased soil erosion includes deep cuts, high fills, earth borrow pits, construction waste/excessive earth disposal sites, temporary construction sites, treatment of special geological conditions and other areas where surface soil will be disturbed. According to the modeling result, the soil erosion intensity will reach 9866.28 t/km²a during construction and for the whole construction period the total soil lost will be 2.33 million t, which is 2.22 million t higher than the current level of soil erosion over the same number of years if there were no project. The increased soil erosion will also occur in the early of the operation phase in areas where vegetation planting is applied for rehabilitation of disturbed soil. Soil erosion for rural road construction is also expected to increase.

During the early stage of the operation phase, the soil erosion will still be higher than the current level because the soil erosion measures such as landscaping will take time to be effective. It is expected that about 3 three years after project operation, the soil erosion will reach about 80-100% or reduce to the levels before the land disturbance, when newly planted vegetation will mature. Some of soil control measures, such as concrete sloping, however, will reach its 100% effectiveness immediately after it is completed.

4.2 Impact on land uses and vegetation

The Project will permanently occupy 12605.5 mu (15 mu to a hectare) of land including 40% of waste land and wood land, and 39.4% of cultivated land. In addition, a total of 104 borrow pits will temporary occupy 7425.4 mu of land and the five borrow pits will occupy 127.66 mu of land, and permanent waste soil disposal land will occupy 576.77 mu. The construction, borrow pits and disposal sites for the connecting roads and rural roads components will occupy more land, permanently or temporarily, but as the rural road is upgrading of an existing road, the permanent occupation of additional land will be minimum.

The vegetation, including crops, trees and other vegetation on the occupied farmland and woodland will be lost to the Project. However, compared with the total cultivated land in the Project areas, that occupied by the Project and thus the impacts to agriculture is relatively small (about 0.013-0.29% of the directly affected districts and townships). Except in the expressway pavement area itself, impacts on vegetation in other portion of the expressway areas will be short termed as the slopes, central separation media, open space of the interchange areas, borrow pits, disposal sites and other temporary occupied areas will be landscaped and rehabilitated with lawns, trees bushes and other vegetation. In fact, it is expected, these landscape programs will result in a net increase in vegetation coverage rate in areas along the expressway.

The proposed expressway alignment is 2 km away from the Sifangshan Botanic Park and 12 km from Niutoushan Forest Park. Because of the distances to these parks, the direct impacts from expressway construction activities as well as noise, air emissions and local damages of vegetation during operation phase to those parks are expected insignificant or negligible.
4.3 Impacts on Water Environment

Construction Phase

Impacts on the water environment during the construction phase include primarily discharge of sanitary sewage from the expected 21 construction camps and bridge construction activities. Each construction camp, with an estimated 200 to 300 workers, will generate about 2 to 3 t of sanitary sewage per day which, if not treated properly, would affect the water quality of the receiving environment. In addition, municipal solid waste generated from the camps, if not handled properly could also affect water quality through contaminated surface runoff.

Bridge construction could result in suspension of river sediments. The construction machines operating in or near the river could also be a risk for oil contamination from potential leaks or spills, affecting river quality particularly during the spawning season of April to June each year. The area affected will generally be a short distance downstream from the bridge construction sites.

Operation Phase

Wastewater sources from the operation phase will include sanitary sewage from service stations and parking lots, car washing effluents and pavement runoff of the first flush in a rainfall event. The wastewater from point sources will be treated to the applicable standards before discharge so the impacts will be limited. The surface runoff is very small compared with the receiving river flows and as such the impact is expected to be insignificant, based on modeling result.

The transportation of hazardous materials, both road transportation and water navigation could pose a risk of water contamination from traffic accidents occurring near the rivers which involve vehicles and water vessels loaded hazardous materials and result in major spills. Based on the frequencies of occurrence of such severe accidents, the prediction results indicate that there exist a very small probability of water contamination from this source. If they do happen, catastrophic consequence may result to water quality, aquatic life and eco-system, health and safety of the people living downstream from the accident locations.

The Danjiangkou reservoir located downstream from the Jiangjunhe river bridge, which is part of the rural road component, will go through a major upgrading through a rise of its dam. The hydraulic modeling shows that the designed dam increase and the resulting water level rise in the river, will not affect the bridge and the navigation under the bridge as the bridge is designed for 100 year flood which is able to accommodate the water rise.

4.4 Noise Impacts

Construction Phase

Construction noise will be primarily from construction machinery. Based on the noise intensity and compounded effect of simultaneous operation of multiple machines, an noise attenuation model predicts that at 55 m from construction machines, the noise levels will be reduced to below the applicable day time noise standards. It will take about 250 m for the noise to meet the standards at night. There are only very small of residents
who live within 55 m from the construction sites so the impacts will be very limited. There are, however, a large number of people within the 250 m area from the construction sites. There would be a significant noise impacts if construction machines operate at night. In addition, residents living on both sides of access roads will be impacted by the higher noise levels from increased traffic of construction transportation vehicles.

Operation Phase

Noise levels for the 23 villages which are located near the proposed expressway are predicted for the years 2009, 2020 and 2028. The results show that noise at all the villages will be within the applicable standards during the day time in 2009. With the increase of traffic on the expressway, some villages will start to be exposed in higher noise particularly at night. In 2020 and 2028 all noise levels during the day time will still be within the applicable standards but 2 villages will exceed the noise standard at night by 1.9 to 2.4 dB(A) in 2020 and five will exceed in 2028 by 0.6-5.9 dB(A). For the schools near the expressway, the noise model predicts that in 2009 two will exceed the applicable standard by 2.3-5.9 dB(A). The same two schools will continue to be impacted by noise over longer terms when noise will exceed the standard by 4.5-8.3 dB(A) in 2020 and by 6.0-9.5 dB(A) by 2028, respectively.

For the rural road upgrading, the traffic is projected to increase from the current level to 1245 MTE/day in 2009 and 2516 MT/day in 2020. Despite the increase, it is still a relatively small traffic volume and there is no noise model which can fit such small traffic volume for noise projection. Based on an analogy assessment, using a rural road under the similar topographic conditions, with the similar traffic volume, the noise in 2009 is expected to be less than 65 dB(A) during the day time and less than 55 dB(A) at night at 10 m from the road side. These levels meet Class III standards. The analogy assessment also predicts that in 30 m from the road side, the noise will meet Class II standards, both day and night times.

4.5 Air Impact

Construction Phase

Airborne dust will be a primary air contaminant during the construction phase. The sources of the dust will be unpaved access roads, Disposal areas, materials storage areas and transportation. The factors affected dust airborne will include climate conditions and type of construction activities. The impact area can be 150 m from the source of dust. Another source of air emission is asphalt and concrete mixing stations. The impacted area can be up to 300 m leeward from the source.

Operation Phase

Using an air dispersion model and motor vehicle emission model, it is predicted that NOx concentrations are expected not to exceed the standards in the year 2028 under the normal weather conditions but exceed the standards under the unfavorable weather conditions. Compared with the without Project scenario, it is expected that more NOx (by 42%) but less CO (by 47%) and THC (by 44%) will be generated because the significantly increased motor vehicle speeds on the expressway over the speeds on the existing highways. The green house gases will be in general reduced.
4.6 Socio-economic Impact

Community Severance

Because the expressway will be fully fenced with limited access, it will separate farmland and rural communities from one another in both sides of the expressway. In total, 23 villages will be affected for access to farmland, services, schools, markets, and/or other parts of the communities.

Cultural Relics

According to the report prepared by of Hubei Provincial Relics and Archaeological Research Institute during the Project EA, the proposed expressway will go through three cultural relics sites: the Jianlilupu site of the New Stone Age (3000-4000 BC), with a total area of 5000 m², Pingchi tomb of Tang-Song Dynasties (300-1000 AD) with a total area of 2000 m² and Shaanan military hospital site (1920-30s). Preservative excavation will be conducted at Jianlilupu site while no actions are needed for the other two sites due to their distances to the proposed expressway alignment. Based on the current assessment by provincial archaeologists, as well as further consultation with other specialists, these three cultural relics sites do not have significant history, cultural or architecture values and are not included in any of the state, provincial or county level cultural relics lists. The site investigation by the Institute and local cultural specialists of the rural road sites find no cultural relics within the rural road impacted areas.

National Reserves

The expressway will go through outside of a national reserve for dinosaur egg fossils. The reserve is divided as central zone, buffer zone and experimental zone. The outer experimental zone has no finds of any dinosaur egg fossils but no destructive construction activities are allowed within the zone according to the relevant regulations. The original K line, at its closest point, is about 45 m to the edge of the experimental zone. While at this distance it would not impact the reserve area directly, but the risk is high as the construction activities could extend to wider areas. Through a sectional alternative line, the final expressway alignment at this area will be 140 m from the edge of the experimental zone, further reduce the risks.

Health and Safety

Health risks are primarily related to increased transit population during construction (construction workers) and operation (visitors) in the regions. The increased mobile population could potentially bring and spread infectious diseases in the Project area. The in-hygiene and un-healthy life style of the workers could spread diseases such as hepatitis and AIDS to local residents as well as among themselves.

The safety risk is primarily in the construction phase with the local residents, particularly children who have little awareness of construction site safety in a linear construction sites with virtually no access control along the expressway alignment. The explosion operation for deep cut and materials borrowing and the resulting flying stones, as well as explosive handling, will be among the most dangerous activities on the construction sites which pose risks to residents. The explosive operation could also affect the safety and structure
integrity of houses in a 500 m radius area through strong vibration of the explosion as well as damaging roof tiles and windows from flying stone from explosion.

Tourism

The proposed expressway will greatly improve the accessibility to the Project areas including local tourist attractions and as a result, more visitors are expected to visit local parks and conservation areas, such as the Wudaoshan Mountain Park (located 40 km away from the expressway). The increased tourists and motor vehicle traffic will bring higher loads to the environment and eco-system in the park, including air emission, sewage, and solid waste generation.

4.7 Resettlement and Relocation

The resettlement and relocation of the proposed expressway will occupy permanently 12605.5 mu of land, affect three urban districts, 92 townships, 46 villages and 142 village groups. The total directly affected families who either lost land, houses or both will be 5020 with 20,398 people. The Project will also occupy yards, water wells, walls, tombs, trees, irrigation systems, country roads and utilities within the expressway area. The impacts will also include mis-management of land and house compensation funds, unsatisfactory with land re-assignment and insufficient compensation for house replacement. However, in general, the new houses following the relocation are expected to be better and bigger than the houses they replace with using the resettlement and relocation compensation funds, representing an improvement of housing conditions and the standards of living.

The total cost of resettlement and relocation, including compensation to all affected, is estimated to be RMB223.37 million.

4.8 Safeguards Policies Assurance

The EA team conducted a screening for ten safeguard policies of the World Bank and, when triggered by the Project conditions, full assessment. The safeguard policies which are incorporated in the EA include Environmental Assessment (OP4.01), Cultural Property (OP4.11), Involuntary Resettlement (OP4.12) and Public Disclosure (BP 17.50). Those safeguards which have gone through the initial screening but found not warrant a full assessment include Natural Habitat (OP4.04), Pest Management (OP4.09), Indigenous Peoples (4.20) and Forest (OP4.36). There remainder safeguards are not applicable because the Project does not have any components involved these safeguards issues. These include Safety of Dam (OP4.37), International Waterways (OP7.50) and Disputed Areas (OP 7.60).
5 Analysis of Alternatives

The analysis of alternatives and determination of expressway alignment include the following process: first, three transportation corridors between Shiyan and Xian, the ultimate destination of this expressway, were identified and compared and the one with the least environmental impacts was selected (in which this expressway is a section). Within this corridor, two alternative alignments were then identified and compared with the one with the least environmental impacts selected as the preferred alignment. Finally on the preferred alignment, fine modifications were introduced in several sections to compare with the original alignment in the attempt to further avoid and minimize potential adverse impacts of the expressway. The expressway alignment is determined based on these three steps in analysis and comparison of different alternatives.

The three corridor alternatives analyzed at the first stage are (see Map 3 for details):

Corridor I: starting from Shiyan through Manchuanguan, Sihepu, Zhashui and ending at Xian, with a total length of 300 km (preferred alternative).

Corridor II: Starting from Shiyan and along national highway 209 north to Xiping in Henan province and then along national highway 312 in Henan to Shaanxi province and then through Zhangzhou and Liantian and finally ending at Xian. The total length for this alternative is 391 km.

Corridor III: Starting from Shiyan going south to Laobailu and then through national highway 316 to Xuyang, Zhenan, Zhashui and Guanghuojie and ending at Xian. The total length of the alignment in this corridor is 395 km.

Corridor I is selected based on the least land occupation and least resettlement, which in turn would have smaller amounts of disturbance and impacts to the natural and socio-economic environments. Furthermore, the area within Corridor I is relatively stable geologically, with mild soil erosion. In addition, the cuts and fills within Corridor I would be the smallest compared with the other two corridors, implying least disturbance and least need for disposal. Corridor I also receives the widest supports from the local governments which is also an important factor in the analysis of alternatives by the EA and other project teams. Mitigation measures have been proposed and included in the engineering design where appropriate as well as in the Project EMP for mitigating adverse impacts expected to be caused by Corridor I, particularly in areas where Corridor I has higher impacts than other corridors.

Within the preferred corridor, limited by the site topography and geology, there are two possible alignments for considerations and comparison, Alignment K (107.14 km) and Alignment B (108.97 km). The two alignments overlap at the Shiyan section and go separate alignments before merged again near the end of this section of expressway at Manchuanguan. Through a detailed analysis of the potential impacts, and comparison of the two alignments, Alignment K is selected as the preferred alignment based on lower soil erosion, lower land requirement, lower biodiversity and lower amount of biomass, cross less rivers with less bridges and in-water construction, less cuts and fills and less tunnels, and less cultural relics, although the Alignment K has higher number of sensitive receptors to noise and higher amount of housing relocation and displaced persons. In addition, Alignment K receives better supports from local governments and less community severance and social impacts by the expressway construction and operation.
Figure 3  Locations of three corridors
Within Alignment K, the preferred alignment, nine sections, named A1 through A4 and A0 and B1 through B4 were identified where alternatives analyzed and compared with their corresponding K line sections. The two alignments and nine optional sections are shown in Map 4. The comparison of these nine sections and results are shown as follows:

A1: This section is to attempt to the issue of the K line going through the north edge of Shiyan city, by move this section further away. However, A1 would impact more schools and does have the support of the local government and thus it is dropped.

A2: A2 is proposed for minimize the disturbance to existing highway G209. By comparison, K line section would affect more villages, dismantle more houses and cross the existing road by six more times, alternative A2 is preferred.

A3: In order to avoid the potential impact to the Qinglongshan dinosaur egg fossil national reserve, A3 is proposed. But this newly proposed alternative section would cross a river with a poor bridge position, and thus is not desirable. Yet, the potential impacts to the reserve are still a concern and another alternative section A0 is proposes.

A0: A0 is located further away from the dinosaur reserve (about 140 m compared with the K line of 45 m) and at the same time the location of bridge is good. Although K line may not have the impacts to the reserve, further away from the reserve, lower the risks. Thus A0 is selected.

A4: This section is proposed to better fit the city planning and development requirement of Qingqi township. In addition, although A4 would have a longer tunnel, it would avoid several sensitive receptors and reduce resettlement needs compared with corresponding K line section. With these considerations, A4 is selected.

B1: This alternative section is based on geological considerations. B1 would go through better geological site and has better solution for spoil soil disposal. But B1 would create more resettlement problems and go through more sensitive receptors, upsetting the environmental benefits brought in geological conditions. Thus, K line section is maintained.

B2: This is option proposed to reduce the spoil soil in the service zone. Furthermore, B2 would avoid three shallow slide areas which could also generate higher geological unstabilities and even disastrous events by the expressway construction during the heavy rain seasons. Although B2 would create more resettlement, it is still preferred particularly after a finer adjustment of line (20-40 m shift) to minimize the increased resettlement and other environmental impacts.

B3: This alternative section is proposed mainly for better geological and construction conditions. Furthermore, this option also is better in hydrological conditions, less land occupation, soil control, etc. Thus, B3 is preferred option.

B4: This optional section is proposed to reduce the Erdaoya tunnel. It achieves this goal but would create more spoil soil need disposal. With all factors considered, the original K line section is still kept.

For the rural road, it is mostly upgrading on the existing road. Any alternative alignment would involve new and green field alignments, and thus more land occupation and more impacts to the surrounding environments. Also the existing road serves mostly the rural communities and many services and other facilities have well established along the existing road, which would be impacted by new alignments. Thus, no alternative alignment is considered and rural road component would be on the existing road.
Already转了
Put slip steel
6 Mitigation

For the adverse environmental impacts of the Project, the EA has developed a series of measures to avoid, minimize, mitigate or otherwise compensate the adverse impact from the project. These mitigation measures are summarized below:

6.1 Design Phase

Soil Erosion

To control soil erosion, permanent engineering works such as concrete and stone pavement on deep slopes and other cut and fills areas are included in the design completely stabilize the soil surface. Other works include interception ditches and landscaping. The borrow pits will be rehabilitated through conversion all five borrow pits into ponds or landscaping following completion of earth borrowing operation. For the 21 excessive construction waste disposal sites, retaining walls, settling ponds, and drainage systems will be built. The stockpiles of the waste will be finally covered with soil and landscaped. The same measures will be taken at all borrow pits and disposal sites used for the connecting and rural roads.

Noise

A number of measures to minimize noise have been incorporated into the design for sensitive receptors at which the noise level is predicted to exceed the applicable standards. These measures, and the proposed implementation time, are summarized in Table 6-1.

<table>
<thead>
<tr>
<th>Mitigation Measures</th>
<th>Implementation Places</th>
<th>Implementation Times (year)</th>
<th>Estimated cost (RMB x1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise barrier</td>
<td>4 schools</td>
<td>2009</td>
<td>1,480</td>
</tr>
<tr>
<td>Tree planting</td>
<td>2 villages</td>
<td>2009</td>
<td>140</td>
</tr>
</tbody>
</table>

In addition, in several villages where no mitigation measures are planned because the predicted noise levels are below the applicable standards, increased noise monitoring will be implemented to ensure the actual noise levels after expressway operation comply with the predictions. Mitigation measures will be taken if the monitored data show noise levels exceed the standards.

Similar measures and application principles, primarily noise control windows for the affected schools and tree planting will also be taken at sensitive receptors along the rural roads where noise level is predicted to exceed the applicable standards.

Water

To minimize the impact on water quality, wastewater treatment facilities will be designed and built at the service areas, including motor vehicle maintenance and repair shops, car washing operations, as well as other domestic facilities at the service areas along the expressway. Aerobic biological wastewater treatment process has been selected and incorporated into the design which is capable of removing COD and suspended solid to meet the applicable discharge standards as per Integrated Wastewater Discharge Standards (GB8978-1996). The car washing wastewater will first go through a pre-
treatment for oil removal before enter into the biological wastewater treatment unit. In addition, the two branch management centers and two maintenance centers are very small and septic tanks will be installed for wastewater treatment before discharge.

Community Severance

To minimize the impacts of community and farmland severance, numerous rounds of consultation have been conducted with the affected villagers. Based on the needs and engineering considerations, on top of the 99 bridges/elevated viaducts and 30 tunnels along the expressway where there is no severance, there will be four over head bridges, 21 grade separate interchanges, 20 passage ways, and 16 culverts capable of pedestrian passing. In total, excluding the river crossing bridges, the expressway will have 145 facilities for pedestrian and farming vehicle crossing. On average, there will be 1.35 crossings for each kilometer of the expressway or the rural residents will need to walk a maximum of 738 meters on average to cross the expressway to the other side. The provisions in the crossing design have been provided to allow various farm vehicles to use as well as for future expansion.

Cultural Relics

Preservative excavation at the cultural relics sites will be conducted and completed prior to the commencement of expressway construction. During this process, all valuable archaeological and cultural articles from the sites will be uncovered, studies and kept by the county museum. The excavated sites will be photographed, measured, documented or modeled if necessary before handed over to contractors for expressway construction. Contractors will be educated to strictly follow the procedures in case there is any chance find during construction. The procedure calls for immediate halt of construction activities and contact relevant authorities. Contractors may resume work at the site if so instructed by authorities and cultural relics specialists following their on site investigation.

Forest Park

Because of the distance to the expressway, the impacts to Sifangshan Botanic Park, Niutaoshan Forest Park and Wudangshan Mountain Park will be insignificant. However, the Project will result in indirect impacts to the park through better access to the park and attraction to more tourists. To mitigate the indirect impacts, an environmental management plan for the parks will be prepared. The specific measures will include locating motor vehicle parking lot at 300 m away from the park area, and providing sufficient garbage bins and washroom facilities.

Resettlement and Relocation

All relocated residents will be properly compensated and received training for new employment. Special consideration will be given to the elderly, illiterate and farmers in terms of compensation. For people whose sources of well water will be disrupted by the construction by the construction of tunnels, additional water wells and other water supply sources will be developed.
6.2 Construction Phase

Temporary Land Occupation

The construction workspace will be minimized to reduce the impact of land occupation. Areas which must be occupied will be re-vegetated after the completion of construction. Workers will be educated to protect trees and other vegetation as much as possible during construction. Temporary settling ponds will be built where necessary. To minimize soil erosion on disturbed soil, temporary protection measures such as grass mats will be applied in places where permanent protection works cannot be complete in time for the draining season.

Construction Noise

Large and noisy construction activities will be kept away from populated areas (150 m minimum). Operation of loud construction machinery and major construction activities will strictly restricted to the day time. Temporary noise barriers will be constructed to protect the sensitive receptors such as schools from the impact of construction noise. Construction traffic will be directed to avoid sensitive locations and completely banned at night time.

Water

To minimize adverse impacts to surface water during construction, cofferdam techniques will be used in bridge column construction with complete isolation of work areas. River crossing construction activities will be scheduled to the extent possible during the low flow periods. The discharge from construction camps will be a potential source water contamination. To mitigate the potential impact, no sewage from construction camps will be allowed to discharge without treatment. The sewage will be either held at the site and empties to treatment facilities regularly or through on site treatment such as septic tank to meet the irrigation discharge standards. For the Jiangjunhe bridge in the rural road component, the in-water construction schedule will avoid April to June of the year during the spawning season.

Air

Unpaved access road and construction sites will be water prayed twice a day (once in the morning and once in the afternoon), or more on dry and windy days to suppress airborne dust. The hog mills and concrete mixing stations and other point sources of air emissions will be located leeward far enough from sensitive receptors (300 m minimum). The best efforts will be given to minimize the number of the hog plants and thus the impacted areas in both expressway and rural roads. Trucks loaded with soil and other dusty materials, as well as materials stockpiles will be covered with canvas.

Construction Camps

Construction camps will be appropriately located to minimize the disturbance to the surrounding communities. Solid and liquid waste will be stored with proper protection and removed from the sites regularly with qualified vendors for disposal. The camps will be maintained in sanitary, hygiene, orderly and good housekeeping conditions to
minimize the health hazards to the workers and adverse impacts to the surrounding environment.

Worker will be educated for hygiene and healthy lifestyle at the construction sites to control infectious diseases and protect the workers and the local communities. Warning signs, public education, necessary barriers, etc. will be provided to protect public safety at the construction sites, especially during explosion operations.

Cultural Relics

Two cultural relics which are right on the project alignment will undertake protective excavation prior to the commencement of construction. The result of excavation will be moved to provincial museums for permanent protection and displays. A procedure for handling “chance finds” will be prepared and provided to the contractors, who will be requested to halt construction until the chance finds have been studied by professional archaeologists and instructed to resume construction.

Contractor Management

Experience with previous World Bank financed expressway project in Hubei province has indicated that high awareness and full participation of contractors in environmental management at construction are critically important to ensure environmental performance. Environmental protection will start from pre-qualification of contractors when environmental awareness and management systems will be an evaluation criterion. The environmental mitigation measures, management and monitoring plans will be incorporated into bid documents to ensure there will be sufficient funding for these activities and the environmental management will be contractual obligations to the contractors. Finally, short course training will be provided to all winning contractors and construction supervision on environmental policies and regulations, potential impacts, mitigation measures, daily monitoring and reporting, and emergency handling.

Rural Road Construction

The rural road component is located in a remote mountainous region and the construction will likely be conducted by local contractors. As these contractors may lack skilled management and operation staff and the government supervision may be weak in remote locations, the environmental management of the rural road construction may be poor. As mitigation, the local transportation bureau and winning contractors will go through an environmental management training program, by specialists selected and sent by Hubei Provincial Communications Department (HPCD). The content of the training will include environmental management during construction, noise and dust control, construction camps management, borrow pits and disposal sites reclamation, and construction safety and health. In addition, HPCD will strengthen its supervision during rural road construction through both HPCD environmental staff and its environmental consultants.

6.3 Operation Phase

Noise

No new school, hospital or other sensitive facilities will be allowed to build within 250 m from the central line of the expressway or 37 to 50 m from the central line of the

Shiman Expressway
connecting roads to prevent noise impacts to these facilities in the future. Traffic management will be enforced and motor vehicles will not be allowed for speedy which generate excessive noise as well as safety concerns.

**Air emission**

Motor vehicle air emissions control requires integrated approach from numerous government agencies as well as private sector stakeholders. The province will enforce applicable standards for motor vehicles and fuels and implement the motor vehicle inspection programs to minimize the air emissions from the increased motor vehicle traffic on the expressway.

**Transportation of hazardous materials**

Hubei province will set up a leading group to handle transportation of hazardous materials and emergency response in an event of a traffic accident involving trucks located with hazardous materials, particularly in sensitive locations such as bridges or other places near surface water bodies. Licensing and permitting procedures will be strictly enforced to control the traffic involving hazardous materials on provincial expressway, connecting road and rural roads network.

**Monitoring**

Extensive environmental monitoring programs will be implemented during both construction and operation phases (details below) to ensure that adverse environmental impacts are as projected during the EA and the mitigation measures proposed will be implemented and effective. In adequate mitigation or new adverse impacts emerged beyond the EA prediction will be detected by the monitoring programs promptly and appropriate new actions will be taken to address them.
7 Environmental Management Plan

An environmental management plan (EMP) has been developed in a separate and stand-alone document. The EMP includes policies basis and applicable environmental standards, environmental management system, mitigation measures and monitoring plans for both the construction and operation phases.

7.1 Objectives

The EMP provides a framework for the implementation of mitigation measures and environmental management and monitoring during the Project implementation. As such, it represents the commitment of Project proponent as well as the governments of the Project area for environmental protection, pollution control and impact minimization. More specifically, the EMP is to:

- Set out the legal and policy framework as well as applicable environmental standards with which the Project will be compliance;
- Identify and design with sufficient details and specifics of mitigation measures for adverse impacts of the Project;
- Specify institutional roles and responsibilities for mitigation measures implementation and environmental management during Project;
- Outlines the requirements for environmental monitoring and reporting needs; and
- Provides a stand-alone document which may be used during Project implementation for Project supervision.

7.2 Management and Supervision Organizations

There will be two layers of organizations who will be responsible for environmental performance of the Project. The first is environmental management organizations including the Environmental Office of the Ministry of Communications, the HPCD, the Project Management Office (PMO) which is the Project proponent, the expressway company to be established which will be responsible for the expressway operation and various technical groups for environmental monitoring and design. The other group is the environmental supervisory organizations which include SEPA and Environmental Protection Bureaus of different levels of government in the Project region.

7.3 Environmental Monitoring

The EMP also includes environmental monitoring programs for both construction and operation phases. The parameters to be monitored include relocation and resettlement, soil erosion, noise, dust, degradation of water quality, stream sedimentation, solid waste disposal, and electromagnetic radiation. During the construction phase, environmental monitoring will be conducted in two approaches: daily and routine monitoring consisting of mainly visual observations and limited equipment measurements such as hand-held noise meters; and periodic monitoring by professionals using standard methods recognized by regulatory authorities. Monitoring reports will be compiled at intervals of once every three to four months, summarizing the findings of the monitoring. The reports will be submitted to project proponent as well as relevant agencies and the World Bank. During the operation phase, noise levels will be monitored once a month for the first six months and once every six months thereafter. Soil erosion will be monitored once every six months, while air and water quality will be monitored once a year.
The specific monitoring programs for air, noise and water are summarized in Table 7-1 through Table 7-3.

### Table 7-1 Ambient Air Quality Monitoring Program

<table>
<thead>
<tr>
<th>Phase</th>
<th>Monitoring Sites</th>
<th>Items</th>
<th>Frequency</th>
<th>Lasting time</th>
<th>Sampling time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Asphalt mixing stations</td>
<td>TSP, asphalt smog</td>
<td>Once a week</td>
<td>One day</td>
<td>One time in the morning and in the afternoon</td>
</tr>
<tr>
<td></td>
<td>Lime and earth mixing sites</td>
<td>TSP</td>
<td>Sampling randomly</td>
<td>One day</td>
<td>The same as above</td>
</tr>
<tr>
<td>Operation</td>
<td>Yunxi county Teacher Training Center</td>
<td>NO₂, TSP</td>
<td>Twice a year (January and July)</td>
<td>Five consecutive days</td>
<td>Successive 18 hours each day</td>
</tr>
<tr>
<td></td>
<td>Chiping village</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 7-2 Ambient Noise Monitoring Plan

<table>
<thead>
<tr>
<th>Phase</th>
<th>Monitoring Sites</th>
<th>Items</th>
<th>Frequency</th>
<th>Lasting time</th>
<th>Sampling time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Yunxi county Teacher Training Center</td>
<td>Leq, A</td>
<td>Once a week</td>
<td>One day</td>
<td>Twice a day and as needed</td>
</tr>
<tr>
<td></td>
<td>Chiping village</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other sensitive receptors</td>
<td></td>
<td></td>
<td></td>
<td>Gradually become routine monitoring</td>
</tr>
<tr>
<td>Operation</td>
<td>Yunxi county Teacher Training Center</td>
<td>Leq, A</td>
<td>Four times a year</td>
<td>One day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chiping village</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 7-3 Surface Water Quality Monitoring Program

<table>
<thead>
<tr>
<th>Phase</th>
<th>Sites</th>
<th>Items</th>
<th>Frequency</th>
<th>Lasting time</th>
<th>Sampling time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Hanjiang bridge site, Tianhe bridge site</td>
<td>COD₂₅, SS, Mineral oil</td>
<td>Once a week</td>
<td>One day</td>
<td>During in-water construction</td>
</tr>
<tr>
<td>Operation</td>
<td>Sewage disposal facilities, Hanjiang bridge site</td>
<td>COD₂₅, SS, Mineral oil</td>
<td>Once a year</td>
<td>Consecutive three days</td>
<td>Once a year and converted to routine monitoring</td>
</tr>
</tbody>
</table>

There will be similar monitoring programs for both the country road and the Jiangjunher bridge of the rural road component.

### 7.4 Institutional Strengthening and Training

To ensure the environmental performance of the Project, the EMP emphasizes the institutional building and strengthening. Besides an organizational structure involving various management and supervision organizations for environmental decision making, monitoring, reporting and further mitigation planning and implementation, the EMP includes detailed programs for personnel training. The programs involve training aboard and domestically for professional, managerial and technical personnel from the governments, project proponent and operation units, environmental institutions and contractors and construction supervisions.

The environmental training for contractors and construction supervisions will be held prior to the commencement of construction. The objective is to ensure that each
contractor and construction supervision unit will have staff on site full time for environmental monitoring on a daily basis. The training will cover the basic knowledge of environmental protection and pollution control, the result of EIA and requirements of EMP, methodology of site environmental management and monitoring, and reporting requirements. The training for HPCD, PMO, the expressway company, and environmental institutions will cover environmental management, regulatory framework, applicable environmental standards and their implications to the Project, mitigation planning, environmental decision making and pollution control technologies. Some of this training will be carried out overseas.

7.5 Estimated Cost for Environmental Management

The cost for environmental management and mitigation measures have been estimated and included in the Project budget. The estimated cost is summarized in Table 7-4.

<table>
<thead>
<tr>
<th>Items</th>
<th>Stages</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIA and environmental studies</td>
<td>Project preparation/design</td>
<td>800,000</td>
</tr>
<tr>
<td>Mitigation measures</td>
<td>Construction/operation</td>
<td>24,623,000</td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td>Construction/operation</td>
<td>4,700,000</td>
</tr>
<tr>
<td>Procurement of monitoring equipment</td>
<td>Construction</td>
<td>160,000</td>
</tr>
<tr>
<td>Staff training</td>
<td>Preparation/construction</td>
<td>510,000</td>
</tr>
<tr>
<td>Engineering work (soil erosion control)</td>
<td>Construction</td>
<td>37,060,000</td>
</tr>
<tr>
<td>Environmental supervision</td>
<td>Construction</td>
<td>259,000</td>
</tr>
<tr>
<td>Rural road EMP</td>
<td>construction/operation</td>
<td>4,218,830</td>
</tr>
</tbody>
</table>
8 Public Consultation and Information Disclosure

Two rounds of public consultation have been carried out during the EA: the first round at the preparation of EA terms of reference (TOR) in December 2002 and the second round at draft EA reports between March 2003 and August 2003. Various methods have been used in public consultation, including public opinion surveys through questionnaires, public meetings at villages and with local people's representatives, and interviews with affected groups and individuals. The people consulted included mainly those who will be affected directly by the project. Relevant government and non-government organizations and experts on various environmental and socio-economic issues have also been consulted.

In total, 2759 copies of a public opinion questionnaire were distributed and 2754 were returned. Among people surveyed, some are well aware of the Project (24.6%) or have some knowledge of it (75.4%). The vast majority of the people (98.9%) felt the expressway, as well as the connecting roads and rural roads necessary and wish to see the construction start as soon as possible. Of the environmental concerns, 86.5% of people surveyed cited noise and 41.3% concerned about dust during construction. Most of the affected people (84.7%) would like to see landscaping and tree planting as a measure to mitigate adverse impacts of the project.

In total, 61 villages, 11 schools, two hospitals, eight local government agencies and eight non-government groups participated in the two rounds of public consultation. There have been a total of 21 public meetings and 85 group interviews. The main public concerns include appropriate compensation for land acquisition and resettlement and relocation, timely rehabilitation or restoration of damaged irrigation systems, construction safety, noise at schools, better access to and exits from the expressway, and sufficient passage ways across the expressway. For the rural roads components, besides the concerns similar to those listed above, the public is also concerned about road block and access to services during road upgrading and student safety at the schools as connecting roads are not fenced, and convenient links with and access to the expressway.

The EA team has responded the public concerns including setting up land acquisition and resettlement offices under HPCD to develop, supervise and implement resettlement action plan (RAP), developing plans for irrigation system restoration, conducting public education and erecting warning signs for construction safety, constructing sufficient passageways and crossings with provisions for pedestrians and farm vehicles (totaling about 1.35 crossing per km on average) to mitigate community severance impacts, install fences at the sensitive sections of the rural road to provide safety protection to students, residents and livestock, install noise insulation windows and tree planting to minimize the impacts of noise from the expressway and connecting roads, and provide full consideration to local economy and transportation needs such as appropriately locating access ramps/interchanges, employment opportunities during construction, etc.

In compliance with EIA process requirements of Chinese government and the World Bank, the completed draft EIA and EMP reports as well as part of the public consultation records were distributed in public places along the expressway, such as libraries, book centers, etc. The concerned public can have the access to and review of the reports at these places. In addition, the Project information and availability of the reports were advertised in Hubei Daily, the provincial wide newspaper and two of the most popular internet web sites in the province (one of which is a nation wide website). The public consultation and information disclosure are summarized in the tables below. The EA
team has distributed an EIA booklet to the affected villages and people along the alignment and plans to disclose the final EA reports in public places to the general public in April 2004.

Public consultation activities and information disclosure for this Project is summarized in Table 8-1 and Table 8-2, respectively.

### Table 8-1 Public Consultation

<table>
<thead>
<tr>
<th>Substance</th>
<th>By whom, with whom</th>
<th>When</th>
<th>Where</th>
<th>Bank’s requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>EA TOR, using public opinion questionnaires</td>
<td>By EA team with affected people and local agencies</td>
<td>December 2002</td>
<td>Villages, schools and agencies along the expressway</td>
<td>OP4.01</td>
</tr>
<tr>
<td>Draft EA TOR Public meetings and interviews</td>
<td>By EA team with affected rural residents</td>
<td>December 2002</td>
<td>258 individuals from 20 villages, 5 schools along the expressway</td>
<td>OP4.01</td>
</tr>
<tr>
<td>Draft EA reports, public meetings and interviews</td>
<td>By EA team, with affected rural residents and local agencies</td>
<td>March-April 2003</td>
<td>1500 individuals from 54 villages, 4 schools, 2 hospital and 8 local agencies</td>
<td>OP4.01</td>
</tr>
<tr>
<td>Draft EA TOR using public opinion questionnaires public meetings and interviews</td>
<td>By EA team, with affected rural residents</td>
<td>December 2002 and March-April 2003</td>
<td>Villages, schools and organizations along rural roads.</td>
<td>OP4.01</td>
</tr>
<tr>
<td>Draft EA reports, using public meetings and interviews</td>
<td>By EA team, with affected rural residents</td>
<td>August 2003</td>
<td>Villages and schools and local agencies along rural roads</td>
<td>OP4.01</td>
</tr>
</tbody>
</table>

### Table 8-2 Information Disclosure

<table>
<thead>
<tr>
<th>Document</th>
<th>Date of disclosure</th>
<th>Location</th>
<th>Bank’s requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft EA report</td>
<td>November 2003</td>
<td>Shiyan city library, Jianmao District Government, Zhangwan District Government, Yun county library, and Yunxi county library</td>
<td>OP4.01</td>
</tr>
<tr>
<td>Draft EA report Final Report</td>
<td>February 2004 (expected) April 2004</td>
<td>Shiyan city library, Jianmao District Government, Zhangwan District Government, Yun county library, and Yunxi county library; Some township governments</td>
<td>OP4.01</td>
</tr>
<tr>
<td>EA booklets</td>
<td>December 2003</td>
<td>Affected villages and people</td>
<td>OP4.01</td>
</tr>
<tr>
<td>Newspaper Advertising</td>
<td>December 31, 2003</td>
<td>Hubei Daily</td>
<td>OP4.01</td>
</tr>
</tbody>
</table>
9 Conclusions

The Shiyan to Manchuanguan expressway will play an important role in alleviating transportation bottleneck between provincial capital Wuhan and Yinchuan in the northwest province of Ningxia, promoting regional economic development, improving access to market and services, and the standard of living, and assisting in poverty alleviation. As a segment of a major transportation trunk road to northwest China, the expressway will also contribute to the Develop China’s West program. The connecting roads provide a better link between some major urban areas in the Project regions to the expressway. The rural roads significantly improve the access of remote rural areas to market, services and townships and counties in all weather conditions.

The construction and operation of the expressway will result in a number of adverse impacts to the physical and socio-economic environment in the Project regions. These impacts include permanent occupation of land, vegetation and agriculture, increased soil erosion, increased noise and air emissions along the expressway alignment, particularly in the environmentally sensitive receptors, community severance, health and safety of local residents, water quality and irrigation systems, and resettlement and relocations. Some of these impacts can be significant.

However, with the mitigation measures designed specifically for the adverse impacts, the impacts will be prevented, reduced, minimized or otherwise compensated. Furthermore, an environmental management systems involving environmental management and supervision organizations, environmental monitoring, institutional strengthening and personnel training will be established to ensure the environmental performance of the Project. The appropriate implementation of the mitigation measures, as well as the environmental systems, the adverse impacts will be reduced to acceptable levels. The Project is environmentally acceptable and feasible when mitigation measures and EMP are implemented effectively.