SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

GUANGXI ROADS DEVELOPMENT PROJECT

IN THE

PEOPLE'S REPUBLIC OF CHINA

April 2001

CURRENCY EQUIVALENTS
(as of 1 April 2001)

Currency Unit	–	Yuan (Y)
Y1.00	=	$0.1208
$1.00	=	Y8.2799

ABBREVIATIONS

ADB	–	Asian Development Bank
CO	–	carbon monoxide
DPA	–	direct project area
EIA	–	environmental impact assessment
ErPP	–	Erosion Protection Plan
GCD	–	Guangxi Communications Department
GEPB	–	Guangxi Environmental Protection Bureau
GZAR	–	Guangxi Zhuang Autonomous Region
NO_x	–	nitrogen oxide
PMU	–	project management unit
PRC	–	People's Republic of China
SEIA	–	summary environmental impact assessment
TSP	–	total suspended particular

WEIGHTS AND MEASURES

dBA	–	decibels measured in the A, or audible noise bands
ha	–	hectare

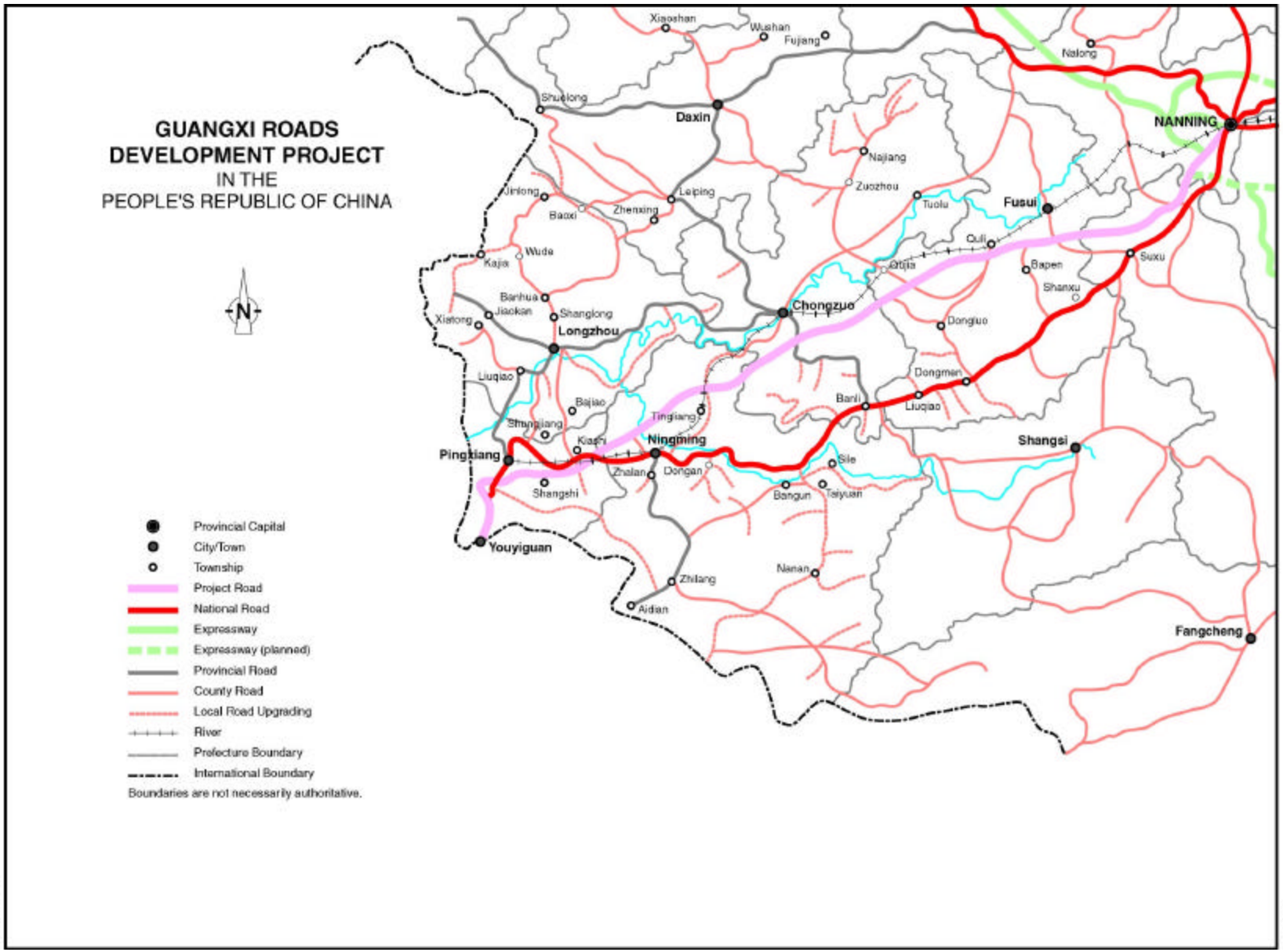
NOTES

(i) The fiscal year ends on 31 December.
(ii) In this report, "$" refers to US dollars.

CONTENTS

Map 1


106°00'E
111°00'E
GUANGXI ZHUANG AUTONOMOUS REGION
IN THE
PEOPLE'S REPUBLIC OF CHINA
HUNAN
GUIZHOU
YUNNAN
GUANGXI
GUANGDONG
HAINAN
26°00'N
22°00'N
Gulin
Hechi
Yishan
Liuzhou
Lipu
Baise
Wuzhou
Laibin
Guiyang
Daxin
NANNING
Fusui
Yulin
Longzhou
Chongzuo
Pingxiang
Youyiguan
Ningming
Qinzhou
Fangcheng
Dongxing
Beihai
Gulf of Tonkin
0 25 50 75 100 125
Kilometers
Provincial Capital
City/Town
Project Road
National Road
Expressway
Expressway (planned)
Provincial Road
Railway
River
Provincial Boundary
International Boundary
Boundaries are not necessarily authoritative.


GUANGXI ROADS
DEVELOPMENT PROJECT
IN THE
PEOPLE'S REPUBLIC OF CHINA
N
Provincial Capital
City/Town
Township
Project Road
National Road
Expressway
Expressway (planned)
Provincial Road
County Road
Local Road Upgrading
River
Prefecture Boundary
International Boundary
Boundaries are not necessarily authoritative.
Xiaoshan
Wushan
Fujiang
Nalong
Shuolong
Daxin
NANNING
Najiang
Zuozhou
Jinlong
Baoxi
Zhenxing
Leiping
Tuolu
Fusui
Quli
Wude
Kaja
Qujia
Bapen
Suxu
Shanxu
Banhua
Jiaokan
Shanglong
Xialong
Longzhou
Chongzuo
Dongluo
Liuqiao
Dongmen
Bajiao
Tingliang
Shangjiang
Kashi
Ningming
Pingxiang
Zhalan
Dongan
Shangshi
Bangun
Taiyuan
Sile
Shangsi
Youyiguan
Nanan
Zhilang
Aidian
Fangcheng

Map 2

I. INTRODUCTION

1. The Government of the People's Republic of China (PRC), the Borrower, has asked the Asian Development Bank (ADB) to finance the Guangxi Road Development Project in the Guangxi Zhuang Autonomous Region (GZAR). This summary environmental impact assessment (SEIA) is mainly based on the information and data in the environmental impact assessment (EIA) report (July 2000) prepared by Xi'an Highway University for the Project.[1] The EIA report was approved by the State Environmental Protection Administration on 22 January 2001. The SEIA report includes discussions with the officials concerned from the Guangxi Zhuang provincial government and experts involved, and the ADB Fact-Finding Mission and its findings in the field. The SEIA report based on the latest road alignment was submitted to the Mission by the Guangxi Communications Department (GCD), the Executing Agency of the Project.

2. The terms of reference of the EIA requires an overall EIA for the Project, including preservation of natural resources; encroachment into historical and cultural monuments; construction problems such as soil erosion, noise, and vibration nuisance; and operational issues such as air pollution and the potential risks of spills from hazardous and toxic chemicals. An environmental monitoring program based on the EIA and in accordance with ADB guidelines has been prepared and is attached to this SEIA. In addition, the opinions obtained from interviews with officials from the Environmental Protection Bureau, environmental monitoring stations, Forest Bureau, Water Resources Bureau, and cultural relics departments at provincial and county levels have also been considered in preparing this SEIA.

II. DESCRIPTION OF THE PROJECT

3. The proposed highway scheme will form part of the national road program known as the Five North-South and Seven East-West Road Network. The current road network linking Nanning City to the Vietnamese border at Youyiguan is in poor condition accommodating local and through traffic, and a mixture of incompatible transport modes. The proposed Nanning-Youyiguan Highway (NanYou Highway) will link with National Highway No. 1 in Viet Nam and thus form part of an international southeast Asian transport route. The locations of GZAR and NanYou Highway are shown in maps 1 and 2.

4. The scope of the Project includes (i) construction of about 136 kilometers (km) of four-lane, access-controlled toll expressway from Nanning, GZAR capital city, to Ningming, about 43 km of four-lane class I road from Ningming to Youyiguan at the Vietnamese border, and about 49 km of class II connector roads between the project road and major towns, including interchanges with toll stations, bridges, tunnels, administrative stations, service areas, and improvement of about 100 km of access roads to affected villages along the project road alignment; and (ii) construction or upgrading of about 710 km of complementary country and village roads to give, or improve, access to poor areas. A summary of the main characteristics of the preferred alignment, the connector roads, service centers, and other administrative structures is given in Appendix 1.

5. The highway passes through Yongning County, Fusui County, Chongzuo County, Ningming County, and Pingxiang City. A connector road to Longzhou County forms part of the highway scheme. These six administrative areas are assessed in detail within the EIA and this SEIA, and are defined as the direct project area (DPA).

[1] Xi'an Highway University. 2000. *Statement of Environmental Impact Assessment.* Xian.

6. Traffic forecasts for the year of opening (2005) to longer-term forecast years (2015 and 2025) for the NanYou Highway are outlined in Table 1. These forecasts are slightly higher than assessed in the EIA partly due to the longer term and different assumptions for travel time and distance.

Table 1: Traffic Forecast (MTE/Day)

Highway Section	2005	2015	2025
Wuxu-Chongzuo			
Wuxu-Quna	7,050	14,000	25,100
Quna-Quli	4,100	8,400	15,900
Quli-Chongzuo	3,900	7,650	14,800
Chongzuo-Ningming			
Chongzuo-Tingxi	3,500	7,300	15,000
Tingxi-Ningming	3,600	7,600	15,500
Ningming-Youyiguan			
Ningming-Xiashi	2,250	5,000	11,300
Xiashi-Pingxiang	3,600	7,500	13,450
Pingxiang-Youyiguan	3,000	6,100	12,300

MTE =medium truck equivalent unit
Source: Consultant's estimate.

III. DESCRIPTION OF THE ENVIRONMENT

A. Biophysical Environment

1. Meteorology

7. The proposed NanYou Highway is in a subtropical climatic zone that experiences a subtropical monsoon climate and high temperatures all year. Annual average temperature ranges from 21.4 to 22.3^{o}C. Rainfall (1,170 to 1,414 millimeters [mm] per year) is concentrated during April to September, with 82 percent of the annual amount falling during this time. Typhoon season for the DPA is May to December. Flooding may occur during this time and has resulted in crop damage in riverine areas, closure of low-lying roads, and damage to bridges and culverts. With an average annual relative humidity of 78-81 percent, the area is generally wet. The terrain and meteorological conditions suggest a high potential for serious erosion and soil slippage problems.

8. Wind velocity does not vary significantly between seasons. The DPA experiences calm conditions between 30 and 65 percent of the time, and average wind velocity is slow, 0.7 to 1.9 meters (m)/second (s). This creates unfavorable conditions for diffusion of air pollutants. Annual average foggy days range from 6.1 to 13.6 days. Fog generally appears between 0400 and 1100, and may cause visibility to drop to less than 1 km.

2. Topography, Geology, and Soils

a. Topography

9. The topography for the first section of the NanYou Highway to Chongzuo (96 km) is light undulating plain with isolated limestone outcrops. The topography from Chongzuo to Ningming changes from flat to rolling and hilly, with some limestone outcrops across the alignment. The alignment avoids the limestone hills, where possible skirting the hills and reducing the amount of

cut required. From Ningming to Youyiguan, the terrain is hilly with rocky peaks within the Dongman active fracture zone. The alignment follows the existing road given the limited choice within the karst limestone hills and valleys. The topography therefore influences the alignment and the cut and fill required during construction.

b. Geology

10. A series of structural systems in the region means that the alignment is located within a complex geological structure containing many developed folds, fractures, and depressions. The fault lines tend to run parallel to rather than across the alignment. Slope protection is required where the faults cross the alignment. The alignment passes through an area of mild seismic activity–lower than class VI using the standard of the Ministry of Communications. Minor antiearthquake procedures are thus required for structures including bridges and culverts.

c. Soils

11. The major soil types in the project area are sand, red soil, calcareous soil, alluvial soil, purple soil, and paddy soil. An investigation into the susceptibility of areas to soil erosion for the whole of the GZAR used remote sensing. The alignment generally falls with the slight soil erosion intensity category (100 – 400 tons [t]/square kilometer [km^2] annually). Areas of expansive soil, along the alignment are located between km 102 to 107 and 135 to 151 and consist of liquefied clay, which expands to become soft and slippery in the wet season, and contracts and cracks in the dry season. Cut slopes along the alignment within these sections will require soil erosion protection measures to minimize slippage and to conserve soil. Given the geomorphology, erosion prevention will be an important mitigative measure and is addressed in detail in the EIA.

3. Surface Water and Groundwater Quality

12. The project area is located within the Zuojiang River system, which includes the Mingjing, Wangzhuang, Xiangshui, and Yongjiang rivers. Throughout the DPA, reservoirs and drainage channels are used for irrigation. Wells, used by some villages for drinking water, are located near the alignment. The river system within the project area indicates that runoff during and post construction could have an impact on a far-reaching water catchment area. The river system provides drinking water for many communities in the DPA. Measures should be implemented to protect this resource and maintain water quality to the current acceptable potable standards.

13. Groundwater consists of two types: pore water and karst water. While groundwater is used for drinking in some of the villages along the alignment, very little is known about its quality. Protection of surface and groundwater quality is an important consideration within the EIA and this SEIA. The floodplains of the Mingjiang, Wangzhuang, and Xiangshui rivers can be inundated with floodwaters. Groundwater levels also rise and in particular locations with subsurface drainage impediments, namely at Qudu (km 44 to km 46 and km 50 to km 55) and at Yuanjing (km 120), waterlogging is likely to occur.

14. The ambient water quality of surface water was monitored as part of the EIA at locations where the NanYou Highway will cross major rivers. The existing water quality (class I and II) of rivers directly crossed by the highway alignment is good, not contaminated, and suitable, with minor treatment, for drinking water. The new highway is not expected to contribute in any way to the degradation of these waters unless gross negligence is involved.

4. Air Quality

15. Ambient air quality was measured in March 1999 at four potentially sensitive sites along the preferred alignment. The results of the quality survey in the project area indicate that ambient air quality is reasonably good with low concentrations of carbon monoxide (CO), nitrogen oxides (NO_x), and total suspended particular (TSP). All concentrations are well within class II standards (PRC Air Quality Standard GB3095-96), probably due to the predominantly rural environment within which the NanYou Highway will be located.

5. Noise

16. The main source of noise in the project area is the existing road (NR-322). Six potentially sensitive locations along the preferred alignment were identified in the EIA and monitored. Currently the project area is quiet with sites monitored outside urban areas complying with class I standards for day and night. The NanYou Highway will have an impact on this quiet environment. The present alignment comes within 400 m from schools and 32 villages in the project area. Vehicle noise generated by the NanYou Highway is a significant environmental effect requiring mitigation.

6. Flora and Fauna

17. The GZAR has a rich and diverse ecosystem partly due to the subtropical climatic conditions and topography. Over 6,000 plant species exist, and a variety of animals including four with state protection. Two protected primate species – the white-headed *langur* leaf monkey (*Presbytis leococephalus*) and the black-headed langur (*Presbytis francoisi*) inhabit in karst hilly areas near the alignment (both are protected as rare and endangered species with class 1 state protection). According to the Forestry Department of the Guangxi Province, there are 53 nature reserves in the province with a total area about 170,000 ha. Three of the reserves are the habitat of the white-headed langurs (*Presbytis leucosephalus*), i.e. Longlin Nature Reserve in Fusui County (12,054 ha) located 15km from the alignment, Lobai Nature Reserve in Chongzuo County (18,530 ha) located 12km, and Longrui NR which is part of the Nonggang NR is around 3km (Appendix 2).[2] The black-headed langurs distribute more widely including also northern Viet Nam and Lao PDR. In Longrui Nature Reserve, the rare white-headed leaf monkeys live in the core area of the reserve. A 10-km section of the alignment (km120 to km130) is nearing the Nonggang Nature Reserve. After careful consideration to protect the reserve and the rare protected species, the alignment is now to be located around 3 km away from the edge of this reserve. Between the proposed alignment and the reserve boundary are steep mountains (about 200-300 m high), which make a natural noise barrier. In preparing this SEIA, discussions were undertaken with the Forestry Bureau, which has the responsibility for maintaining the reserve. In addition, local researchers from universities who are active in studying the species have been consulted. Considering the distance between the road and the closest boundary of the reserve and the mountainous terrain, it is unlikely that the Project will have adverse environmental impacts on the NonGang Nature Reserve.

18. The DPA contains undisturbed forest particularly in the mountainous areas. Most of the alignment is through agricultural land with the section from Pingxiang to the Vietnamese border

[2] Nonggang Nature Reserve covering a total of 10,077.5 ha, located within Ningming and Longzhou counties. This nature reserve represents as a complex of three nature reserves extending southeast to northwest, i.e. Long Rui (3,644.8 ha), Longgang (5,424.7 ha), and Long Hu (1,008 ha) with a total area of around 10,077 ha.

(17 km) through some plantation forest, mostly pine trees. The forest plantations and shrub-covered areas of the hills need to be protected to stimulate the slow ecological recovery that the national Government is nurturing through their national tree replanting campaigns

19. The karst topography contains caves and the opportunity for rare flora and fauna. Based on the design study, the road will not likely pass through any such caves. If such caves are found during construction, a rapid inventory is recommended to take protection measures. Otherwise, potentially unique life forms could be eliminated.

7. Fisheries and Aquatic Biology

20. The region's rivers are being used for the extraction of aggregate materials and some are used as sewage conveyances. The core river system in the DPA still has reasonably good water quality, and fish is an important food source for communities along the river systems. Protection of water quality and aquatic habitats is an issue addressed in the mitigation measures within this SEIA.

8. Land Resources

21. The dominant land use along the preferred road corridor is agriculture. This is interspersed with rural residential and village uses. Some of the agriculture is based on subsistence farming and elsewhere on cash crops. Sugar mills and associated industries, using by-products, are already established in rural areas and the major cities to be connected by the NanYou Highway. Cross-border trade in fruits is also becoming increasingly important. Pork, poultry, and beef are produced throughout the study corridor, but primarily on a small scale. Most of the wet agricultural land is irrigated by an intricate system of small canals and aqueducts bringing water to the terrace field by gravity flow. Road construction through these areas will disrupt these irrigation systems.

22. The largest proportion of land affected will be dry land and sugarcane land. Dry land is often used to grow fruit trees. Forestland also contributes a significant portion of land taken. The total of land use and land take amounts to about 1,456 ha, consisting of about 390 ha of dry land, 396 ha of sugarcane land, 170 ha of forestland, 130 ha of economic forestland, 120 ha of wet land, 250 ha of barren land, and others such as fish pond. All of the forestland affected by the Project are plantation forests, mostly Eucalyptus and pine, and the wetlands consist of irrigated agricultural land.

9. Areas of Cultural and Historic Importance

23. The DPA has tourist attractions including natural areas such as the stone forest in Chongzuo, the Xiniudong caves in Fusui, the internationally renowned frescos at Huashanya in Ningming, and the border passes in Pingxiang, particularly Youyiguan's Friendship Pass. The alignment generally avoids existing tourist attractions and, in some instances, improves access to them providing a positive benefit for the tourist facility.

24. Important cultural relics are located near the alignment, particularly in Pingxiang City. A detailed survey was undertaken for the EIA and the following cultural relic areas were identified:

(i) The Suyuanchun Official Camp is located 200 m north of Naling Village in Pingxiang City. Only part of the camp structure is visible but the campsite itself is around 130 m^2. The official camp does not have any designation under the Cultural Relics Protection Law, but county status will be sought in the near future.

The Suyuanchun Official Camp was designed by the Pinxiang governor in the Qing dynasty (over 200 years ago) for receiving gifts from Viet Nam. The camp is located 10 m east of the railway and 20 m west of the NR-322. It will be over 20 m from the right-of-way. Protection of the campsite during construction will be required.

(ii) The Sino-France war cemetery is near Aikouyie village in Pingxiang City. It contains the tombs of soldiers from the Zhennanguan battle in the Sino-French War in 1885. Located in the Guangqianai Battlefield, the tombs within the cemetery were relocated two years ago during the construction of the PingYou class II road. The alignment passes beside the cemetery. The cemetery should be protected during construction and operation of the highway.

(iii) The Guangqianai Battlefield covers an extensive area from Aikouyie village to Youyiguan's Friendship Pass. The battlefield, the site of the Sino-French war (1885) has county cultural relics significance. Many thousands of soldiers died during this war and the site is of significance to more recent Chinese history. The alignment passes through the battlefield closely paralleling the existing highway. Particular care will be required during construction as construction activities may unearth cultural relics from the famous battle.

25. Three other relics are located near the alignment: the Balai Cliff fresco near Biji reservoir, the Bage Cliff fresco near Quli, and the Rentou Cliff fresco near Shangshi railway station. These frescos have county protection and are between 200 m and 2 km from the alignment. They will require protection particularly during construction to ensure the cliffs are not quarried nor the frescos harmed by construction workers. The EIA and SEIA address this mitigation measure.

10. Mineral Resources

26. The DPA contains mineral reserves including coal, granite, marble, copper, iron, gold, and a swelling soil that is rare and currently being mined. Small coalmines are operated in some locations along or near the alignment. Along the existing road and the proposed alignment are limestone, marble, and rock quarries. The rock quarries will be used to supply stone for the NanYou Highway. The proposed alignment does not directly interfere with mineral mining operations. However, mitigation measures are proposed for rock quarries to ensure dust is controlled and blasting is avoided during the night.

B. Social and Economic Environment

27. Chongzuo, Fusui, Longzhou, Ningming, and Yongning counties and Pingxiang City present unusual socioeconomic conditions. Four of the counties were designated as poor but all have recently experienced improvements in living conditions. The main feature of the socioeconomic environment is that the economy of the DPA and the GZAR has expanded rapidly in recent years. Sectoral performance varies with the rural counties reliant on agriculture, but Pingxiang City and Ningming County's expansion in the service sector reflects the impact and importance of border trade on the local economy. Generally, however, the DPA's economy is primarily agricultural.

28. Cash crop production, particularly fruit, relies on timely transportation to markets. The new road will have a significant positive impact on the DPA in this regard. Secondary roads connecting to the project road will be an essential element to making this transportation corridor useful for the local rural population, although land use planning regulations will be required to control development pressures along the road alignment.

29. Around 77,000 people live in the natural villages that will be affected by land and property acquisition for the highway and expressway (about 5 percent of the DPA population). The number who will experience direct loss is however much smaller, approximately 31,000. Around 80 percent of the villages affected by the alignment are minority groups, mostly Zhuang. The alignment passes through poor areas but has minimized loss of property by avoiding urban areas. This SEIA and the EIA emphasize protection of residents from potentially adverse environmental impacts such as noise and dust during construction and operation of the Highway.

IV. ALTERNATIVES

30. Two key alternatives are possible, (i) the "do nothing" alternative, i.e., continue to use the existing road as is; and (ii) improve other transportation modes such as rail, river, and air. Doing nothing would not help to further the region's major objective, which is lifting the regional economy out of the poor category. Leaving the existing lower class road system unchanged would continue to stifle road transportation throughout this region of the PRC and hamper cross-border trade. This alternative would continue adverse environmental impacts such as noise and air pollution, which would become even more significant as the volume of traffic increases, and congestion would be severe by 2005. Rail, river, and air transport accounts for only 22.6 percent and 9.4 percent of the movement of goods and people in the PRC, and its expansion would be much more costly, since huge capital expenditures, in terms of both infrastructure and passenger terminals, would be required. Therefore, building a new and better road was the logical and preferred choice.

31. Two major alternative alignments were evaluated at the planning stage of the Project. The differences are summarized in Appendix 3. For the Ningming section, the major differences between alternative A and B were the length, resettlement numbers, hectares of land required, and distance from the NongGang Nature Reserve. The preferred alternative (alternative A) is 5.5 km shorter, requires 24.6 ha less land and 2,622 m^2 less buildings to be removed. From an environmental perspective alternative B will cause more erosion than alternative A. The proposed highway between km115 to km127 has been slightly altered to move it 3 km away form the nature reserve; this will mitigate any potential environmental problem to the NongGang Nature Reserve.

32. Important distinguishing features between the two main alternative alignments (C and D) for the Pingxiang section are the shorter length and less land taken for alternative D. Alternative D has been selected even though it requires a tunnel and a viaduct.

33. The alignment selected within the preliminary design is generally acceptable and poses no significant adverse environmental impacts. All potentially adverse impacts can be mitigated with the measures to be implemented.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Topography, Geology, and Soils

1. Soil

a. Construction Period- Impacts and Mitigation Measures

34. The PRC enacted the National Soil Erosion Protection Law (No-49) in 1991. This law and Regulation No. 120, prepared in 1993, specifically address the need to prevent erosion primarily from taking place for different types of development through proactive planning methods. It specifies the need for erosion protection plans (ErPP). In 1998, the State Council declared Regulation 253, Environmental Management Regulation for Construction Projects, which also specified the need for ErPPs. The law and its regulations require that all large projects such as the NanYou Highway prepare a specific ErPP as part of the EIA. The Water Resources Bureau recently approved the ErPP.

35. Table 2 shows the calculations of cut and fill required for the highway scheme assessed in the EIA for the NanYou Highway. Of the total 24.396 million m^3 of excavated materials, 2.467 million m^3 will not be used, 1.677 of earth and 0.790 of stone. While the construction will use cut for fill in all sections, the topography dictates that more fill is required in the flatter sections and spoil from cutting is generated in the hilly sections around Pingxiang.

36. Predictions within the EIA (Section 4.2) indicate that the DPA experiences slight soil erosion of around 312 t/km^2 per year. This is predicted to rise during construction to between 1,395 and 1,626 t/km^2 a year for the flatter sections and up to 2,800 t/km^2 in the larger cut sections if mitigation measures are not undertaken. Soil erosion protection measures are therefore required during and post construction. Borrow and spoil sites have been identified in the preliminary design and use topographical features to remove soil and rock and to dump spoil. Stockpiling of cut and fill material during construction could generate soil losses from (i) excavations to subgrade and erosion of the temporarily stored materials, (ii) abandonment of soil, and (iii) failure to revegetate spoil and borrow sites on completion of construction.

Table 2: Summary of Balance of Earth and Stonework for Embankments

Section	Length (km)	Cut ($10^4 m^3$)				Fill ($10^4 m^3$)			
		Total Cut		Spoil		Use		Borrow	
		Earth	Stone	Earth	Stone	Earth	Stone	Earth	Stone
K0+000-K96+400	96.4	556.3	294.9	86.9	28.4	469.4	266.4	117.8	–
K96+400-K130+600	34.2	278.6	201.7	41.8	20.4	236.8	181.3	86.4	–
K130+600-K177+465	46.9	589.5	279.6	21.2	14.4	568.3	265.3	96.7	–
Summary	177.5	1,424.4	776.2	149.9	63.2	1,274.5	713.0	300.9	–
Fusiu Transit		9.7	1.1	0.0	0.0	9.7	1.1	12.9	–
Chongzuo Transit		5.5	0.6	0.0	0.0	5.5	0.6	0.5	–
Ningming Transit		2.1	0.9	0.9	0.3	1.2	0.6	4.3	–
Longzuo Transit		118.9	97.7	16.9	15.5	102.0	82.2	30.5	–
Pingxiang Transit		0.6	1.9	0.0	0.0	0.6	1.9	17.0	–
Total		**1,561.2**	**878.4**	**167.7**	**79.0**	**1,393.5**	**799.4**	**366.1**	–

– = not applicable – stone taken from existing quarries.
Source: Xi'an Highway University. 2000. *Statement of Environmental Impact Assessment.* Section 4.2.1.4

37. The primary preventative defense against erosion should be the preparation and implementation of an ErPP, according to PRC law and regulations. This should be prepared by GCD (or its nominee) and approved by the Water Resource Bureau prior to construction. The ErPP should form part of the contract documents between the GCD and the construction contractors. Sound construction techniques are the best method to minimize erosion. Contractors thus have a crucial role in preventing erosion. As such the following steps, additional to those set out in the EIA, should be undertaken by contractors:

(i) Contractors should carefully balance the amount of cutting and filling to reduce the need to store excavated materials for a long time before reuse. Having accurate quantity estimates is essential if losses are to be minimized.

(ii) Since year-round construction is planned, erosion during rainy periods needs to be avoided by making sure that, prior to rainfalls, construction roads are stabilized, and extremely muddy conditions and runoff, fueling soil loss, are avoided.

38. The following steps set out in the EIA will also need to be undertaken by the contractors:

(i) In areas where the volume of fills and cuts is high, bank stabilization and retaining walls must be constructed as work progresses. Any known unstable slopes are to be secured with various anchoring and benching methods, as prescribed in the contract specifications and under PRC law.

(ii) Slopes in cut and fill areas must comply with grades set out in Design Specifications of Highway Environmental Projection Guidelines (JTJ/T 006-98) and Technical Standards of Highway Project (JTJ 001-97) and as documented in the design specifications. The excavated roadbeds must be supported by stone pitching, drainage ditches, and grassing of the slopes as soon as practical during construction–not after the road base has been fully constructed. Surveillance of erosion protection and of slope grades must occur frequently during construction.

(iii) In areas of expansion soils that are more prone to slope collapse and soil erosion, engineering measures must be undertaken as set out in JTJ001-97.

39. In areas effected by construction (permanent and temporary), including any borrow pits, spoil sites, and access roads, a strict plan of revegetation and soil stabilization should be prepared as part of the ErPP. The ErPP should address the removal of topsoil from borrow sites, its storage, and its reuse on the borrow pit site on completion. Soil stabilization should be done immediately (within a week or so) after the construction is finished in any subarea, or if construction ceases for the season.

b. Operational Period: Impacts and Mitigation Measures

40. During the operation of the NanYou Highway no significant impacts are predicted other than those resulting from neglected mitigative measures such as failure to protect water and maintain plantings or revegetation schemes (as discussed in the EIA). Organic soil removal that leaves barren areas could also have long-term negative impacts. To guard against this the Guangxi Expressway Administration Bureau should prepare a mitigative measure and maintenance checklist, as a component of the execution plan, have it completed on a monthly

basis, and make it available for inspection by ADB and external environmental auditors. This checklist should be a simple form listing the mitigative measures as defined in Appendix 4, actions taken to implement the measures and performance against monitoring criteria.

41. The NanYou Highway and the connector roads predominantly pass through agricultural land, concerns over traffic-related lead contamination within a 400 m wide corridor centered over the selected alignment are now not an issue given that leaded fuel is being totally phased out in 2000. Oil levels within a 400 m corridor will increase but should, once emitted by combustion, quickly settle on the carriageway and within the right-of-way land. According to the EIA, farming and crop harvesting will not be permitted within the right-of-way and thus should not be adversely affected.

2. Rock Quarries, Borrow Pits, and Sand and Gravel Extraction

42. Twenty-six quarry sites along the alignment will provide crushed rock for construction. These quarries already have road access but detour roads will be required to enable construction aggregate materials to reach the road sections. Haulage distances average 8.32 km. The use of existing rock quarries is acceptable in preference to opening new quarries with no road access. Blasting and dust should be controlled at quarries, and form part of the contractual agreement when agreeing to purchase aggregate materials. The standard approach to quarry extraction is to crush the material on-site before transporting it to the work site. The rock crushing generates large quantities of fine dust (often in the 10-micron range), and noise, which in quiet rural areas, can be heard at a great distance. These sites should include dust control and a time limit on daily operations.

43. Sand and grit will be obtained from existing river dredging operations along the Mingjiang, Yongjiang, and Zuojiang rivers. The average road haul is just over 21 km, again using existing roads except for the access road to reach the construction site. No information has been provided within the EIA on the quantity of sand and gravel extraction, and the effects it could have on riverbank erosion, aquatic ecology, and water quality of the rivers. An extraction management plan should form part of the ErPP and address the quantity of material to be obtained, general locations, and mitigation measures to avoid riverbank erosion and to protect water quality.

44. Thirty-eight borrow sites have been identified along the alignment. The following process, the basis of which is contained in the EIA but expanded within this SEIA, should be undertaken to avoid the loss of soil and to implement a strict borrow-site rehabilitation and restoration program. A four-step process should be undertaken at every site:

(i) Prior to initiating any excavation, access road construction, and the like, contractors must prepare a borrow site layout (2-4 page document), which defines where topsoil is to be stored, how it will be protected from the elements during the extraction period, and how and when the site will be operated and finally closed and/or revegetated.

(ii) Although no new roads to borrow pits are proposed, existing roads must be maintained to ensure vehicles using the roads do not generate additional environmental problems including soil erosion (mud).

(iii) Revegetation will involve replacement of soil and the planting of a vegetation cover, including trees, to stabilize the area as soon as possible after it is no longer in use.

(iv) Regular dust suppression must be carried out on all gravel access roads to borrow pits during the construction period in dry conditions. This will avoid damage to any nearby crops and buildings and should prevent degradation of local air quality up to 400 m from the edge of the roadway.

3. Spoil Sites and Cut Construction

45. Improper disposal of excavation materials from cutting is potentially a significant issue. One hundred and eleven spoil sites will require mitigation measures to avoid creating an adverse environmental impact. Dumping of spoil along the alignment will be controlled within the EIA by all spoil being deposited at nominated spoil sites. However, surveillance must be conducted along the alignment to ensure that all spoil is dumped at the nominated sites. On-going maintenance, revegetation, and rehabilitation measures for all spoil sites should be documented in the ErPP and form part of the contractors' terms and conditions.

46. An excavation materials disposal plan should be prepared for large cuts into valley slopes and cuts longer than 200 m horizontally and 10 m vertically. This plan should be prepared and implemented by the contractors, and included in the contractors terms and conditions. Such plans should include (i) use and management of waste materials, (ii) a materials transport scheme, (iii) placement, (iv) stabilization of waste stockpiles against precipitation and wind, (v) drainage system design, and (vi) rehabilitation of any exposed areas. The plan needs to form part of the mitigation measures nominated for spoil sites within the ErPP.

B. Ground and Surface Water

1. Groundwater

a. Construction Period

47. No significant effects on groundwater are expected given the topography, depth of groundwater reserves, and dominant use of surface water as a source of drinking water. However in the karst geological areas, primarily in the Ningming and Pingxiang sections, groundwater reservoirs are likely located in underground caves, rock fissures, etc., which, when exposed or disturbed, can cause contamination, leakage, and loss of groundwater; loss of artesian pressure; and well depletion. In some locations, away from the karst hills the groundwater is known to be close to the surface namely at Qudu (km 44 to km 46 and km 50 to km 55) and at Yuanjing (km 120). Waterproofing and pavement protection is therefore necessary in these sections.

48. If, during construction, groundwater reserves are found, then drainage channels (piping or creating a seal with concrete) must be used to enable groundwater flow to continue and to prevent leakage. Viaduct construction will require the placement of piers, averaging several meters in diameter, in riverbeds and valley bottoms. Fissures and cracks leading to groundwater resources could be exposed, therefore a system for immediate closure, using high-grade

concrete, will be required. The method for this activity should be specified in the contractors' specification.

b. Operation Period

49. The operation of the highway should not affect the groundwater system unless chronic groundwater seepage is not stemmed and maintenance is not vigilant in detecting and capping groundwater leaks. A protocol for groundwater detection and prevention should be included in the environmental mitigation measures execution plan handed from GCD to the Guangxi Expressway Administration Bureau.

2. Surface Water

a. Construction Period

50. The key concerns for surface water quality during construction, as contained in the EIA, are the construction of piers in the riverbed, runoff from unprotected slopes (soil erosion), runoff from materials storage areas, emissions from machinery and construction techniques (dust), and domestic sewage from the construction workers.

51. Given the amount of cut and fill sections of the NanYou Highway properly sized drainage structures are required as specified in the design documents. The expressway design incorporates 1,342 culverts and underpasses. Temporary drainage structures will be required during construction and should be included in the basic surface drainage layout as part of the detailed design used by contractors. Proper protection practices such as detention of drainage waters during construction as specified in the contractors' specifications will need to be strictly adhered to and monitored by GEPB (para.82). Temporary settlement tanks, as specified in the EIA, should be dug at locations where runoff is expected from the subgrade construction works. A geotextile filter should be provided at the outlet to catch sand and mud.

52. Because the natural drainage of the area will be significantly modified by the road and access roads that will act as earthen dams, restricting flows to the culverts, pedestrian underpasses, and streams, the following mitigative measures, as specified in the EIA, are required:

(i) All toxic, hazardous, and harmful construction materials (such as caustic and acidic substances, oil and petroleum products, and asphalt materials) must be handled so that none enters the water system. They should be stored away from watercourses, and provided with soak pits to contain accidental spills.

(ii) All toilet facilities should be, as a minimum, pit latrines that are serviced and maintained, including removal and processing of sewage as they fill, according to a defined schedule.

(iii) All construction area drainage to water bodies must be controlled by preparing settling basins or vegetated runoff areas, allowing the contaminated water to be slowed or detained, and the sediment and other nonwater soluble components to be filtered out as the water percolates into the surrounding soils. At large viaduct construction sites, where pier excavation will be extensive, cofferdams and caissons will be used, with the former used for rivers with smaller flows and the latter for rivers with larger flows.

(iv) Diversions for irrigation channels must be constructed prior to the construction of the road and at a time when irrigation water is not required. Village officials and the Water Resource Bureau in each county must be consulted to agree on construction times, relocation of the channels, and protection of permanent or temporary channel systems during construction.

b. Operational Period

53. Operational period impacts will likely be limited to direct roadway surface drainage into watercourses, improper maintenance of erosion protection works, inadequate management of solid and liquid waste for the permanent offices and service centers along the highway, and inadequate accidental spill management. Surface runoff pollution prediction calculations within the EIA indicate that, in normal circumstances, the impact on water quality from water runoff from the highway surface will be minimized. However, the following mitigative measures are recommended:

(i) Roadway runoff should not be placed directly into watercourses but allowed to flow over grassed or pervious areas to permit the settling of fine materials, detention of oily water, and reduction in volume and rate of flow. This can be achieved by constructing detention basins/depressions, and should be planned as part of the earthworks design.

(ii) Erosion protection works, such as grassed or stabilized slopes, will need regular maintenance and inspection, particularly during the first year in operation to be sure that the erosion protection measures are functioning (e.g., plants are still alive and adequately watered).

(iii) Waste and sewage at permanent expressway offices and service centers should be managed. Septic tanks require maintenance and monitoring to ensure wastewater is properly treated before leaving the site. Solid waste management through a contract with locals for pickup, reuse, and recycling processing is recommended.

(iv) Oil traps should form part of the drainage systems implemented on bridges over waterways. Similarly oil and grease traps should be provided at all service centers, parking areas, and expressway administration buildings to ensure oil and grease is filtered from water runoff. The oil traps should be serviced regularly.

(v) A spill contingency plan or emergency plan for hazardous and toxic materials should be prepared, giving clear instructions on (a) who has authority to act, (b) what to do, and (c) who must act in the event of a spill of any hazardous materials carried on the expressway. The plan will be distributed to all key personnel within the Expressway Administration Bureau's Maintenance Department and will be known to all expressway management staff. An experienced consultant should be retained to prepare this plan.

C. Flora and Fauna

54. Natural flora and fauna in the DPA have been reduced over time due to the extensive farming. However, in the border area in Longzuo and Pingxiang counties and around Ningming, primary and secondary vegetation exists. The Nonggang Nature Reserve has been protected not only because of rare fauna but also because of the limestone hill forest and the unique karst geological formations. The ecosystem of the limestone forest, providing a habitat for a variety of faunas, is rare in the DPA and efforts of the PRC to protect such ecosystems should be acknowledged by the Project. Both the construction and operation of the highway raise environmental issues (noise, dust, and loss of habitat) in this area. The direct impacts of the Project on the white-headed langurs during construction phase is still within acceptable levels, since the three nature reserves which are the habitat of the langurs are located at adequate distance. Noise from blasting and, to a lesser extent, drilling, may carry long distances. However, the leaf monkeys resides in the middle (core areas) of the reserve, and it is separated by a series of high limestone outcrops that may become an effective noise barrier. The final alignment (around 3 km away from the nearest border of the Longrui reserve) and the steep mountain ranges between the alignment and the border will minimize the environmental impacts to the Nonggang Nature Reserve and the langurs population.

55. Vegetation along the alignment has decreased over time to a few pockets located far from the road alignment. To stem erosion, trees have been planted along existing roads and in some areas across which the road passes. About 1,306 ha will be lost permanently for the road, while about 150 ha will be required temporarily during construction.

56. During the operating period of the road, the plantings should be maintained within the right-of-way, paying particular attention to watering and disease control. Trees outside the right-of-way that are a part of the replanting program will also need to be tended until they are mature enough to withstand full seasonal climatic conditions without external help. This will be about three years after planting. Monitoring and maintenance of trees must form part of the ongoing mitigation measures execution plan for the Guangxi Expressway Administration Bureau as specified in this SEIA.

D. Air Quality

1. Construction Period

57. Air quality conditions along the alignment are presently above class II standards and therefore good. Activities during construction could affect air quality particularly in areas close to the alignment. Emissions during construction stem from (i) dust caused by aggregate preparation, concrete mixing, and transport of borrow and spoil material; (ii) odor emissions from the bitumen plant(s); and (iii) internal combustion engine emissions from truck traffic and heavy equipment operation at the construction site and on the roads to and from the borrow and spoil areas. Dust plumes from aggregate plants, concrete plants, and truck traffic will usually be confined to a radius of 400 m from the source. Based on monitoring conducted by other EIA authorities in the past, levels exceeding the class III standard were recorded 150-200 m from the source of typical construction air polluting/dust generating activities. For example for truck traffic, dust along access roads was nearly 20 times the background level at 150 m from the source, suggesting serious localized effects.

58. Remedial measures, partly addressed in the EIA, to overcome potentially adverse localized air quality impacts include the following:

(i) Storage sites, concrete mixing stations, and asphalt plants are to be sited more than 300 meters downwind from the nearest settlement.

(ii) Dust suppression equipment should be installed in aggregate and concrete plants. Construction roads should be watered, based on a set daily schedule (considering weather conditions), using water trucks, to reduce the dust levels such that they are confined to a maximum of 5 m on either side of the road. All truck loads of aggregates and spoil will need to be covered during haulage.

(iii) Diesel equipment should be properly maintained based on a published maintenance schedule and unnecessary idling should be curtailed.

(iv) Monitoring at sensitive locations (as listed in the tables 1-11 and 1-12 in the EIA) will occur on a bimonthly basis. The sensitive locations will include residential areas or school sites within 400 m of active construction activities. These locations will be nominated by environmental officers within the project management unit (PMU) and coordination with the contractors. Monitoring will be the responsibility of GEPB, but undertaken by Guangxi Environmental Monitoring Station. If TSP readings are found to be above class III limits, a check of equipment and activities will be undertaken by GEPB and if non-compliance with the remedial measures is found, compliance will be formally requested or fines imposed. Other mitigative measures may be introduced if exceptional situations exist.

2. Operational Period

59. Modeling and estimation of future air quality conditions was completed for CO and NO_x in the airshed along the proposed road corridor (Section 4.5 in the EIA) in two locations for forecast years in 2005, 2015, and 2025. The two villages used to demonstrate future air quality conditions are typical of a village in the flatter terrain areas (Biji Village at km 38 + 000) and more rugged terrain areas in the karst hills (Baima Village km 145 + 300). Traffic volumes used to predict CO and NO_x are based on traffic forecasts in the preliminary design report. Slightly higher traffic volumes contained in Table 1 have not been modeled and are not expected to significantly influence the outcomes.

60. In both cases, air quality for CO and NO_x meet class II standards of GB3096 – 1996, which is the accepted standard for air quality in residential areas. Because this standard is met up to 2025, the proposed NanYou Highway is not predicted to have a significant adverse effect on air quality or ambient air quality. The predictions for two typical locations for CO and NO_x levels and for the 42 sensitive sites (schools and villages as specified in the EIA) are to remain within acceptable PRC standards. As such, no mitigative measures, apart from ongoing monitoring, are required. The EIA recommends that GEAB be responsible for monitoring NO_x and TSP at two locations, Bijicun and Xiashi, twice yearly for five days.

E. Noise

1. Construction Period

61. Noise impact during construction could be severe and result from construction activities in general and, in particular, from the operation of heavy machinery. Machinery commonly used for construction projects includes excavators, bulldozers, graders, stabilizers, concrete mixing plants, drills, and stone crushing and screening plants and rollers. Noise intensity from these activities ranges from 78–85 decibels measured in the A, or audible noise bands (dBA) and 58–64 dBA at 10 m and 100 m from the source, respectively. Consultant's estimates indicate that three different types of machinery operating at the same time will generate around 70 dBA at 100 m from the source during the daytime. When piling activities are involved (as proposed for large and some medium-size bridges) daytime noise levels are likely to exceed 70 dBA at a distance of 200 m from such activities. Blasting, particularly for cut areas, is a possibility. This will create a problem near the residential areas within 1 km of the blasting sites.

62. Given that such construction noise is unavoidable, noise management such as proper equipment maintenance, operating equipment away from residential areas and within their specified design limits, and operating equipment at reduced intensity during low activity periods (2000-0600) will greatly reduce annoying noise. Blasting mats and mufflers on piling equipment are recommended for sensitive sites (km 115 to km 130 for the NongGang Reserve and within 2 km of residential dwellings, community buildings, and service areas). Millions of truckloads of cut and fill materials will be transported to and from the construction sites. Given a proposed 24-hour work schedule and a year-round construction season, any roads passing through or near villages will experience continuous noise in the 70-80 dBA range. Mitigative measures proposed in the EIA and expanded within this SEIA, for all construction activities are as follows:

(i) To reduce night noise, work hours within a 1 km radius of any settlement area should be restricted to 0600 to 2000 and, if possible, the movement of heavy vehicles on urban and village roads should be restricted during these hours.

(ii) Special noise generators such as mobile crushing and mixing facilities should be located at least 2 km from the nearest community or service areas, such as restaurants, hotels, or tourist site.

(iii) All construction equipment should have well-maintained muffler systems and be operated within design limits.

(iv) Blasting mats will be required for all blasting activities and blasting will not occur during the night-time, i.e., between 2200 and 0600; and

(v) Monitoring of active construction sites that are within 1 km of sensitive sites (see tables 1-11 and 1-12 in EIA and any additional sites identified on the alternative alignment between km 115 and km 127) will occur on a monthly basis for one day with noise levels taken for day and night activities by GEPB or its nominated representative from the Guangxi Environmental Monitoring Station. If noise standards are exceeded, a check of equipment and construction conditions will be undertaken and measures put in place to immediately rectify the situation. If mitigation measures are not being implemented, fines on contractors should be considered.

(vi) If measures are unable to rectify excessive noise, additional mitigation measures must be introduced. This could include improved mufflers for equipment or construction, and use of temporary acoustic barriers.

2. Operational Period

63. The EIA provides extensive noise predictions, based on initial traffic volumes, fleet composition, average vehicle speed and pavement type. Given that a perceptible change in noise levels (3 dBA) requires a doubling or halving of traffic, the revised estimates are unlikely to significantly alter where noise attenuation will be required. Table 3 summarizes noise predictions for the preferred alignment assessed in the EIA for nominated time periods. These noise levels indicate that within the first year of operation acceptable noise levels for residential areas will have been exceeded in a noise corridor extending 20 m to 200 m on either side of the carriageway. Twenty years into the operation of the NanYou Highway, noise levels will rise, particularly at night, further degrading local noise conditions.

Table 3: Predicted Noise Levels at Varying Distances from the Carriageway (dBA)

	Daytime				Nighttime			
Distance	**20 m**	**60 m**	**100 m**	**200 m**	**20 m**	**60 m**	**100 m**	**200 m**
Year								
2005	67~68	60~62	57~58	52~54	60~61	50~52	46~47	40~41
2010	69~70	62~64	59~60	54~56	61~63	52~54	47~49	41~43
2015	72~73	64~66	61~63	57~58	64~66	54~56	50~52	44~46
2025	73~74	65~67	62~64	58~59	65~67	55~57	51~53	45~47

dBA = decibels measured in the A, or audible noise bands, m = meter.
Source: Xi'an Highway University. 2000. *Statement of Environmental Impact Assessment.* Xian.

64. The EIA identifies 32 noise sensitive sites (tables 4-3-5 and 4-3-6 in the EIA). These sites, mostly consisting of residential development or community buildings (schools), were modeled to determine if an excess of class II standards could occur during the day and night. Seventeen villages were found to have noise levels exceeding acceptable standards, as were three schools on the NanYou Highway alignment. Six sites, including one school, were identified as requiring noise attenuation measures on the connector roads. Additional mitigation measures may be required for the alternative alignment between km 115 and km 127 as villages are located in this section.

65. Where possible, the preliminary design takes advantage of natural noise attenuation features such as hills, berms, and depressions. For the construction of large viaducts however, sound attenuation features such as lower-friction pavements and low vertical grades should be considered.

66. In accordance with noise attenuation measures contained within the Highway Environmental Protection Design Principles Guidelines (JTJ/T006-98) and within the EIA, the following mitigation measures are proposed:

(i) For sensitive areas permanently affected, provide options to construct noise barriers and other forms of screening. Wherever possible these screens or barriers should be at the source of the noise (i.e., beside the carriageway). Where sites are within 30 m of the carriageway, relocation may be necessary. The option of relocation or barriers should be given to those affected.

(ii) Restrict new dwellings of any kind from within 100 m of either side of the carriageway.

(iii) Plant a variety of tree and shrub species as soon as possible after construction has finished in any construction working zone (within the 30 m wide band) within the right-of-way, such that by 2010 or earlier, a fully developed tree/shrub barrier is growing.

(iv) Specific mitigative measures are for the 32 sensitive sites identified on the NanYou Highway alignment and the connector roads. The noise attenuation measures should be implemented as the work is completed along these road sections, not after all construction ceases.

(v) Monitoring of ambient noise levels will occur at four locations (Aikuo, Hualong, Xiashi, and Xincun villages) twice yearly. Noise levels will be monitored twice within a day measuring daytime and nighttime noise. If noise levels are exceeded during operation above that predicted additional noise mitigation measures will be implemented by GEAB.

F. Land Acquisition and Resettlement

67. The requirement for land acquisition is around 1,306 ha, about 60 percent of which is currently under cultivation. Another 150 ha will be required as temporary borrows during construction. Around 6,600 households will be affected by this acquisition (about 31,000 people) through loss of land assets and services. The involuntary resettlement effects resulting from the construction of the NanYou Highway have been kept to a minimum by choosing an alignment that avoids all major towns in the project area. No more than around 300 households will require relocation, which is low given the 230 km road length. Virtually all affected persons will be able to relocate in their own villages. A livelihood restoration plan is being developed. A summary of the Resettlement Plan is given in Appendix 5.

68. The key recommendations to mitigate these losses from the RP are outlined in Volume IV of the EIA. Additional mitigation measures proposed within this SEIA to accommodate potentially adverse environmental effects of land take and resettlement are as follows:

(i) To help small communities recover after the land acquisition and resettlement process, all damaged irrigation canals will be repaired, rural roads damaged by construction vehicles will be repaired, and a green belt will be planted along the slopes of the expressway. GCD will bear all costs.

(ii) The construction of the NanYou Highway and connector roads will result in farmers losing access to their fields, or having their fields bisected by the new road. Some school children's normal route to school will be blocked. Passageways, underpasses, and overpasses will be placed, on average, every 500 m along the road. Numbers will be higher where the expressway passes near a town or village. Local citizens have voiced their concern that in past projects crossings were placed at inconvenient locations, resulting from a failure of the local communication bureaus to consult the community affected. Therefore, the final design and placement of these structures will take place only after local users have been consulted (not just informed).

(iii) Wardens will be posted on all active sections of the construction sites at key locations to assist in crossing the alignment or directing residents to safe crossings. Where the NanYou Highway is parallel to or converges with the NR-322 alignment, traffic wardens will assist traffic flow during construction of the road.

G. Cultural, Social, and Economic Impacts

69. The three cultural relics identified in close proximity to the alignment will not be adversely affected by the finally decided alignment. Protection of the remains of the Suyuanchun Official Camp 200 m north of Naling in Licha village in Pingxiang County will be required. Excavation of the camp should occur prior to construction to determine the exact boundaries of the camp and clarify its cultural relic protection level. Funding for an excavation has been allocated within the environmental mitigation measures within the EIA and this SEIA. Additional protection of the site is also required during construction. A temporary fence should be erected along the NR-322 roadside of the camp to stop construction vehicles and construction workers accessing or using the site for storage of materials. No borrow pits or spoil sites are located near the official camp. Construction contract managers are to be informed of the importance of the site and surveillance by the PMU during construction should ensure that the cultural integrity of the site is retained.

70. The three fresco sites listed in the EIA (the Balai Cliff fresco, the Bage Cliff fresco, and the Rentou Cliff fresco) are not located near spoil sites or borrow sites and will not be quarried for rock or stone. Surveillance of the sites should occur at regular intervals to ensure construction activities or workers do not damage the frescoes. Construction managers will be informed of the frescoes' location and importance to ensure staff and construction activities do not interfere with these sites.

71. Other cultural relics and archaeological remains may be unearthed during construction. To record, and where appropriate, remove and protect important discovered relics, all contract managers and staff should be made aware of the National Cultural Relics Protection Law.

72. The social analysis undertaken for the Project concentrated on the potential impact on farmers who will constitute the largest beneficiary group. Other subgroups investigated were traders, existing service providers on NR 322, road users (bus operators, drivers, and passengers), and enterprises. The overall conclusion is that the impact of the Project will be overwhelmingly beneficial with adverse impacts only likely to be felt by a few who will lose land and/or property and the few existing service providers. A series of recommendations has been made to enhance potential benefits to affected subgroups and reduce possible adverse impacts.

73. An extensive program of around 710 km of secondary road improvements is proposed as part of the overall NanYou Highway Scheme. The socioeconomic evaluations outlined in the EIA report indicates that the NanYou Highway and the secondary road scheme will accrue benefits to residents in the DPA. Some disbenefits will require mitigation, such as the implementation of strict land use zoning.

74. The primary negative socioeconomic impact will be felt by ribbon development entrepreneurs currently plying services on the existing NR 322. The hardest hit entrepreneurs will be those whose businesses depend on through traffic. Grocery storeowners will be relatively insulated from negative impacts because their clientele is largely local. Also insulated will be the commercial establishments that are likely to benefit from the highway, freight costs will be reduced while access to markets accelerated and expanded.

75. A positive impact of the new road will be the increasing profits to villages and farmers from increased access to markets, including international markets, as a result of timely and more efficient transport network. Local economic improvements from border trade are already occurred in Pingxiang. The NanYou Highway will link with the N1 highway to Hanoi in Viet Nam and thus help frontier trade between the PRC and Viet Nam. The highway and connector roads are expected to accelerate the exploration of natural resources and facilitate economic growth in the agriculture sector, particularly for cash crops such as sugarcane and fruit, by improving access to markets. The boost to the local and regional economy is expected to be the core benefit of the Project.

H. Summary of Mitigation Measures

76. Major mitigation measures and assignment of responsibilities are listed in Appendix 4. The responding capital and annual operational costs associated with all environmental mitigative measures are reflected in the project cost (para. 78). Appendix 4 provides the key outputs of the EIA and this SEIA, and should be used by GCD during the planning and construction stage of the roadway, and by GEAB during the project operating period.

77. A table of mitigative measures should be appended to all contract documents and be referred to in the loan covenants between PRC and ADB. This should ensure that GCD actually carries out these recommended measures.

VI. ECONOMIC ASSESSMENT

A. Costs of Environmental Mitigation

78. The overall direct cost of construction of the NanYou Highway and connector roads will be about Y2.8 billion. Total environmental costs (both capital and recurrent costs) during construction are estimated at Y30.2 million, which is less than 1 percent of the total construction costs. Capital and operating costs of putting in place and executing the environmental specifications in the EIA are detailed in Appendix 6. Capital costs for environmental works during construction will be around Y29.1 million and recurrent costs for the same period around Y1.1 million. All construction environmental capital costs are accounted for in the construction and other budgets. Annual operating expenses are estimated at about Y620,000 per year. These costs are those generated by the environmental requirements and are not part of the regular expenses accounted for elsewhere in the project budget.

B. Benefits of Environmental Mitigation

79. Direct and indirect benefits from the NanYou Highway and the mitigation measures are manifested in many ways. Several of the more important and overarching benefits are outlined in Table 4.

Table 4: Examples of Key Environmental and Economic Benefits of the Project

Item	Activity
1.	Reduced unit traffic cost, e.g., fuel and maintenance savings
2.	Reduced travel distance (NanYou Highway is 49 kilometer shorter) when compared with the existing NR-322 highway (fuel and use saving)
3.	Reduced air emissions along the existing road due to fewer stops and starts, and speeds <35 kph, compared with increasing emissions along the new alignment due to speeds >80kph.
4.	Reduced future noise along existing road, but increases along alignment located in rural areas
5.	Reduced risk of hazardous material spill due to better road conditions, better traffic flow, and less necessity for dangerous maneuvers.

Kph = kilometer per hour.

80. The complementary road schemes should enable rural communities to benefit from the NanYou Highway. Benefits accruing to the urban business people located at or within a few kilometers of the interchanges benefits are expected to filter down to people in the remote and rural valleys, particularly farmers. However, these latter benefits are dependent on the complementary road schemes to improve access to the road network throughout the DPA. Once improved access is obtained, wider community benefits can be gained, such as access to health facilities, employment, education, and other community facilities. The mitigative measures proposed will be cost-effective as long as the facility or process is given administrative support and, once installed or initiated, is complied with and maintained.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PROGRAM

A. Institutional Requirements

81. To undertake a competent environmental compliance monitoring program, four ingredients must be in place within GCD and its local partners:

(i) administrators and managers who believe in environmental management and monitoring;

(ii) skilled environmental monitors and analysts who understand the purpose of monitoring and the implications of environmental degradation, and who are committed to undertaking a thorough job (not necessarily within GCD, but also in the provincial environmental monitoring station);

(iii) a clear system of reporting and method for responding to problems, compliance failures, complaints, etc.; and

(iv) a system for collecting and organizing information, permitting the monitor to see trends and prepare information-rich reports that address important issues succinctly and can trigger action by managers.

82. GCD is committed to undertake the mitigative measures recommended. Indeed the recently opened Nanning to Guilin Highway (Binyang–Nanning section) has implemented environmental protection measures specified in the EIA. The State Environmental Protection Administration recently inspected this highway as part of the "check and accept procedures" required as an operational mitigation measure and found that mitigation measures were implemented as specified. However, ongoing monitoring of noise, air, and water quality is still to be undertaken. The GEPB and the Nanning Environmental Monitoring Station, with which they collaborate, have all the necessary skills to undertake the monitoring and reporting during and post construction. Y960,000 were included in the project cost for training and retaining environmental technicians and specialists to assist in implementing environmental protection measures.

83. The contractor has an important role in ensuring mitigative measures are implemented from the commencement of construction activities. GCD and its governmental counterparts in GEPB must ensure that contractors are aware of their environmental protection responsibilities. This SEIA recommends that

(i) the contract documents clearly set out the contractor's obligations to undertake environmental mitigation and monitoring activities (contractors must prequalify on environmental grounds) appended to the contract specifications;

(ii) GCD organize an in-country training program to State Environmental Protection Administration specifications on monitoring, information analysis, and reporting; and

(iii) GCD appoint specific environmental monitors and give them strong mandate to carry out their work, and supply them with basic equipment to permit rapid turn around of information, reporting, and action.

B. Environmental Monitoring Program

84. An environmental monitoring program has been prepared (Appendix 7) in conjunction with environmental mitigation measures. Monitoring will involve compliance monitoring, consisting of surveillance to check whether the requirements of the contract are being met by the contractor and GCD during the construction and operational period respectively.

85. The timing of the monitoring is important since mitigative measures will not all start at the same time and will need to be continued, as in the case of the operational period measures, through 2025. The compliance monitoring will be done whenever mitigation measures are to be implemented throughout the construction period and annually during the operating period. Monitoring for the Resettlement Plan should start six months before construction begins since relocation and restitution along any road section should be finished before construction starts.

Monitoring during construction will begin in 2001 (or whenever construction begins) and for the operational phase in 2005. Monitoring will involve the Guangxi and Nanning Environmental Monitoring Station, both during construction and operation phases as these are the only organizations in the GZAR with the skills and equipment to undertake technical environmental monitoring procedures and provide informed comment on the results. The construction contract documents will contain a listing of all required mitigation measures and a timetable for the compliance-monitoring program of these activities.

VIII. PUBLIC INVOLVEMENT

86. Public involvement and consultation was undertaken in June 1998 and in September 1999 (chapter 9 of the EIA report). Participation and consultation exercises consisted of a series of meetings with local government agencies, people's representatives, and institutions along the proposed NanYou Highway alignment. Meetings were also held with village committees and interviews with individuals. Public opinion polls (116 people were surveyed) were also undertaken consisting of surveys of mostly "Yes-No" or multiple choice questions.

87. From the results of the public meetings and completed questionnaires, the major public opinions and concerns on the Project can be summarized as follows:

(i) 90 percent of survey respondents support the Project and consider it a necessity to promote economic development and poverty reduction in the region;

(ii) 88 percent of the households interviewed and affected by resettlement wish to be resettled in the same village, and request compensation for land acquisition and resettlement to be distributed promptly, with villagers indicating their strong demand for direct compensation for resettlement; and

(iii) environmental conservation was highlighted, particularly the provision of noise barriers near schools.

88. The consultation process may have been skewed in favor of the road. Weaknesses appear to exist in information dissemination especially when compared with surveys of villagers for the Resettlement Plan. During field trips, as part of the research for this SEIA, the consultants found that the officials such as county environmental protection bureaus were not familiar with the alignment and were not aware of monitoring roles allocated to them in the environmental monitoring program. The answers given for the EIA consultation exercises cannot be interpreted as a good reflection of the opinions and requested mitigative actions of the people most affected by the Project. With a total population of over 1.57 million people in the counties affected by the Project, a survey involving 116 people, or 0.007 percent of the population, is not representative.

89. Consultation with county officials from the Communication Bureau, environmental protection bureaus, and water resources bureaus and, in one instance with the Cultural Relics Department provided varied opinions on the expected environmental impacts of the NanYou Highway and the connector roads. These consultations revealed that key environmental issues are soil erosion, conservation, and protection of fragile ecosystems and cultural relics.

90. More intensive studies were conducted by the team of consultants focusing on social and economic impacts. Participatory rural assessment methodology was used to determine the villagers' perceptions of the impact of the expressway on their lives and on their communities.

Results of this more comprehensive consultation exercise are contained in the EIA. The environmental issues raised by the public and officials have been addressed by mitigation measures within this SEIA.

IX. CONCLUSIONS

91. The predicted negative effects of the preferred highway alignment will be minimized and/or reduced to an acceptable level if prescribed mitigative and monitoring actions are carried out. Residual effects should be offset by the longer-term economic gains for the counties. The revegetation, including major tree replanting, of the roadway right-of-way in each subsection immediately after construction ceases in that section, will help to stabilize the construction zone as the work progresses. The NanYou Highway will reduce congestion on NR-322, and at the same time, will reduce air pollution, noise, and accidents in that corridor. This will be at least partially offset by noise and air emissions along the expressway.

92. The expressway should have a positive economic impact on the road corridor, providing quicker access to large markets and a convenient, congestion-free travel route for many. The preferred alignment will have the least direct negative impact on both the natural and social environment. Increased noise and air pollution along the expressway as traffic volumes build will be offset by appropriate noise attenuation measures, vegetation belts, and improvements in engine technology.

93. The adjustment of the alignment of the section between km 115 and km 127 to minimize adverse environmental impacts on the NongGang Nature Reserve has been undertaken as part of the refinement of the preliminary design. By establishing a safe distance of 3 km between the edge of the reserve and the highway, a nationally, and probably internationally, treasured ecosystem containing the white-headed leaf monkey can be preserved.

94. This SEIA and the EIA should be used as the basis of any effects and compliance monitoring program, and specifically the preparation of the mitigative measures execution plan and checklist (para. 85). Monitoring is planned to continue through the operating period of the Project and will be conducted by the Guangxi Environmental Monitoring Station and Guangxi Environmental Administration Bureau.

95. A comprehensive monitoring and reporting schedule will be prepared by the Guangxi Environmental Monitoring Station under the direction of GCD, and will be used to establish the permanent record of how well GEAB has met its commitments as specified in this document, the EIA and the Resettlement Plan. The table of mitigation measures in Appendix 4 and the environmental monitoring program in Appendix 7 should be used when preparing these schedules.

96. Much of the environmental and biophysical impacts of this road will take place during construction. The protection of the environment during that period will be entrusted to the contractors building the road. They traditionally have the least training in or awareness of environmental problems and how mitigative measures should be implemented. To address this gap we conclude that State Environmental Protection Administration should develop training, that would be mandatory for successful contractors and address environmental management, the implementation of mitigative measures, and reporting. This training should also be required for GCD, PMU and GEAB staff involved in highway construction and operation.

97. Erosion and earth slippage could be a major problem for this Project. Careful and immediate revegetation and slope stabilization, as the work is done in any one section will be essential to keep soil losses and danger to a minimum. Extra precautions need to be taken in preparing and approving the ErPP.

98. Cutting and filling will generate thousands of tons of waste. To be able to manage fill and borrow sites, and as part of the ErPP, waste disposal layouts should be prepared for cuts more than 200 m in length and 10 m in height. Sand and gravel extraction areas must be nominated in the ErPP and measures specified to ensure riverbank erosion does not occur.

99. Rehabilitation of borrow areas and associated access roads will require considerable and sensitive actions by the contractor. The PMU, with assistance from the contractors, should contract local village units to rehabilitate sites in their local region. Thus, revenues from the Project will flow to the local people who will have say in what happens in their area.

100. Provided all of these mitigation measures are implemented, the environmental impacts of the Project will be minimized to acceptable levels. Under these circumstances, the Project is not expected to cause significant environmental impacts, and rather bring about positive social and economic impacts and benefits.

APPENDIXES

Appendix 1

SUMMARY OF KEY CHARACTERISTICS OF THE PROJECT SCOPE

Characteristic	Unit	Proposed Alignment: Expressway+Class I + Class II
Total Length	km	230.42
Width of Subgrade	m	26/24.5/22.5
Earth and Stone Work	million m^3	28.057
Large Bridges	m	962
Medium Bridges	m	1,252
Small Bridges	m	202
Short Tunnels	m	1,220
Culverts and Underpasses	number	1,342
Interchanges	number	7
Grade Separated Crossings	number	68
Major Railway Crossings of Nan-You Railway	number	6
Land Acquisition Requirement	ha	1,305.9
Temporarily Used Land	ha	150.1
Building Removal	m^2	21,710
Quarry sites	number	26
Borrow Pits and Spoil	number	149
Construction Work Force	thousand person-days	18,942
Excavation	million m^3	26.863
Fill	million m^3	25.590

ha=hectare, km=kilometer, m=meter, m^2=square meter, m^3=cubic meter.

Appendix 2

INFORMATION ON THE NONGGANG NATURE RESERVE

1. NongGang Nature Reserve is located between Ningming and Longzhou counties and has an area of about 8,700 hectares. It consists of Longrui Nature Reserve, which is located within Ningming and Longzhou counties and has an area of about 2,100 ha, and other reserve areas nearby. Originally the Longrui Nature Reserve was designated as a national class I protection zone by State Council in 1982 to protect the karst geological system, white-headed leaf monkeys, and black leaf monkeys, which form part of a unique ecosystem. Later on in 1997, it was developed to a larger reserve area called NongGang Nature Reserve. It contains 1,282 species of flora and 123 species of fauna.

2. The white-headed lagur (leaf monkey) is considered to be one of the most rare monkeys in the world with fewer than 1,000 left in southwest areas of the Guangxi Zhuang Autonomous Region (GZAR). The monkeys live within a 200 square kilometers narrow area along Zuojiang River within Chongzuo, Fusui, Ningming, and Pingxiang counties. They live in family groups inhabiting caves in the karst mountain system and rely on natural fruit trees found in the karst mountains for food. Agriculture and human development has depleted food sources over the years reducing the habitat within which the monkeys can live. The monkeys have been hunted to near extinction and to prevent the monkeys from continuing to be hunted, the GZAR government issued additional regulations strengthening the Protection of Wild Animals and Action Against Criminal Activities (Guizhengfa No. 107, 1993). The monkeys (both white-headed langur and black langur) were hunted as their bones are reportedly considered to have aphrodisiac qualities. Unfortunately the alcohol that contains bones of white-headed leaf monkey can still be found in local villages.

Appendix 3

COMPARISON OF ALTERNATIVE ALIGNMENTS

Item	Unit	Ningming Section		Pingxiang Section	
		Alternative A[a]	Alternative B	Alternative C	Alternative D[a]
Length	km	44.18	49.67	18.26	16.11
Earthwork	thousand m^3	5,305	6,410	1,185	2,029
Mid. Bridges	m/number	477.8/7	628.6/16	58.08/1	155.24/3
Culverts	number	120	118	70	67
Underpasses	number	67	80	2	2
Sensitive areas	number	6	8	51	3
Land acquisition	ha	254.5	279.1	89.3	92.5
Houses removed	m^2	1,773	4,395	3,400	2,200
Advantages		5.5 km shorter	Complies with local government land use plan	Best use of existing road corridor	2.15 km shorter
		Y145 million saved	No overpasses over railway line	Less quantity of fill required	Avoids conflict with the existing Class II road
		Flatter and smoother alignment; Better geological conditions	No interference with communication line of border troops	Less farmland acquired	Less land acquired and buildings to be removed
		Less earthwork	Shorter connection to county roads in Ningming		Less subgrade earth work
		Less land acquisition			
		Less resettlement			
Disadvantages		Near Nonggang Nature Reserve	More filling required at Mingjiang bridge	Interferes with Tianqiao-Nanshan Class II road	Would need to build a tunnel and a viaduct
		Interferes with communication line of border troops	Passes through 27 km expansive soil area	More land acquired and buildings to be removed	High embankments in cut and fill areas
		Twice extra rail crossings	Takes more land	Removal of existing gas station	
		Difficult fill areas;			
		Length of connector road to Ningming			

ha=hectare, km=kilometer, m=meter, m^2=square meter, m^3=cubic meter.

[a] Alternative A (Ningming section) and Alternative D (Pingxiang section) have been selected.

SUMMARY OF MITIGATION MEASURES PROPOSED AND ASSIGNMENT OF RESPONSIBILITY

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
1. Preconstruction Phase						
1.1 Soil Erosion Conservation	The ErPP will be prepared, detailing all soil protection measures during construction and post construction. It will include bank stabilization and retaining wall methods, unstable slope anchoring and benching methods, gradients of slopes, location of drainage ditches, a landscaping schedule for grassing and treeing of slopes and their ongoing maintenance, accurate quantities of cut and fill, location and management of borrow and spoil sites including rehabilitation plans for each site, quantities and location of sand and gravel extraction and river bank erosion protection techniques, and an excavation materials disposal plan.	Legal requirement Paras. 34 to 41	Throughout the project corridor	Before construction starts	Contractors	GCD (PMU) and approval by WRB
1.2 Implementation Mechanisms	A Mitigation Measures Execution and Monitoring Plan will be prepared based on this table, the SEIA, EIA and EMP. It will contain all mitigation measures set out in this table as well as the Monitoring Programme set out in Appendix 7. Roles and responsibilities will be allocated to each task.	Contract terms and Conditions Paras 84-85	Throughout the project corridor	Before construction starts	Contractors during construction. GEAB during operation	GCD (PMU) GEPB
1.3 Removal of Trees	Trees will be removed from the RoW before commencement of construction and after prior consultation with the Forestry Dept. and local community.	Legal requirement	Surveyed Construction width of ≈ 30m	Before construction starts	Contractors	GCD
1.4 Taking of Land and Property	Information dissemination and community consultation about the entitlements based on new Land Admin. Law will occur. All relocation and resettlement activities must be reasonably completed before the construction activity starts in any road sub-section. Compensation will occur as per the RP.	RP and Project requirement	The RoW as defined in the RP	Before construction starts in any road subsection	County-level Communication Department	GCD

EIA=environmental impact assessment, EMP=Environmental Monitoring Program, ErPP=Erosion Protection Plan, GCD=Guangxi Communications Department, GEAB=Guangxi Expressway Administration Bureau, GEPB=Guangxi Environmental Protection Bureau, PMU=Project Management Unit, RoW=right of way, RP=Resettlement Plan, SEIA=summary environment impact assessment, WRB=Water Resources Bureau.

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
1.5 Utility Relocation	All utilities will be relocated with prior approval of the concerned *agencies*. Relocation will be reasonably complete before construction starts on any sub-section of project roads.	Contract Specifications	Refer utility relocation drawings	Before construction starts	County Communications Department and Contractors	GCD
1.6 Removal of Community Utilities	All community utilities such as community water source pipes will be replaced at appropriate and suitable locations. Replacements will be reasonably complete before construction starts.	RP requirements	Any water source located within construction zone	Before construction starts	County Communications Department and Contractors	GCD, Local Community Committees
1.7 Archeological Excavation and Identification	Further archeological excavation and identification should be undertaken to determine the extent and cultural significance of the Suyuanchun Official Camp.	Cultural Relics Protection Law. Cultural Relic Protection and Management	K175+900 and k180	6 months or earlier before construction starts	Pingxiang Museum and Cultural Relics Dept of GZARG and Contractors	GCD, Cultural Relics Bureau of Pingxiang County
	A temporary fence will be constructed along the NR322 section adjoining the Camp to protect it from construction activities and workers. This will be undertaken irrespective of the findings form the excavation and before construction commences.	Specifications in GZARG Suggestion from Pingxiang Museum				
1.8 Relocation of Irrigation Systems	Irrigation systems for agricultural activities which will be effected by the project will be re-located before construction starts. The relocation of the channels and canals shall be discussed and agreed with village leaders and county WRBs prior to commencement of the works.	Contract Terms and Conditions Para 52	Any irrigation system located within construction zone	Before construction starts	County Communications Department and Contractors	Local Community Committees, County WRBs
1.9 Environmental Protection Training	Before construction starts, training on environmental protection and cultural relics protection etc. for the Project Engineer and key staff of the construction contract companies shall be undertaken.	Contract Terms and Conditions		Before construction starts	SEPA	GCD
	Training for additional monitoring technicians and specialists shall occur for air, noise and water monitoring and for surveillance during construction.	Para 82			SEPA/Foreign Consultants	

GZARG=Guangxi Zhuang Autonomous Region Government, SEPA=State Environmental Protection Administration.

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
2. Construction Phase						
2.1. Soil						
2.1.1 Generation of Excavation Materials	Cut and fill should be managed, as per design. Earth, as 'fill' will be dumped in areas selected (and approved by the engineer, for such purpose). Residual spoils shall be used, as directed by the CPE and according to an ErPP prepared by each contractor (see 1.1 above). All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental to the work and should be planned and implemented as approved and directed by the CPE.	Design requirement and contract specifications Para. 44 FIDIC: 32.1	Throughout project corridor at all construction sites	During construction	Contractor.	CPE, GCD with assistance from the WRB
2.1.2 Loss of Topsoil	In agricultural areas, or in any other productive soil areas, as directed by the CPE, the topsoil from all areas of cutting and all areas to be permanently covered shall be stripped to a specified depth (based on Prov. Agriculture Dept. specifications) and stored in stockpiles of height not exceeding 2m. Maintenance of the stockpiles will be in accordance with the ErPP. Topsoil will be returned to cover the disturbed area and cut slopes, with excess distributed to local community Topsoil will be minimally handled so as to avoid loss.	Soil Erosion Protection Law, No.49-'91 and Reg. No. 120 of PRC	Throughout Project Corridor and all borrow and spoil areas.	During construction	Contractor.	GCD with assistance of WRB, GEPB

CPE=construction project engineer, FIDIC=Federation Internationale des Ingenieurs-Conseils

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
2.1.3 Compaction of Soil	Construction vehicles, machinery and equipment shall move or be stationed in designated areas (RoW or, as applicable) only. While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, topsoil from agricultural land will be preserved as per 2.1.2	Contract specifications	Throughout Project Corridors and all temporarily used areas	During construction	Contractor	CPE, GCD with assistance from WRB
	The contractor shall ensure that the method of stockpiling materials, use of plants or siting of temporary buildings or structures do not adversely affect the stability of excavation or fills.	Contract specifications	At all cut and fill sites			
2.1.4 Borrowing of Rock	Borrowing within the RoW is prohibited-under this contract. However, rock available from excavation for roadside drains as per the design, may be used as embankment material if material is suitable, subject to approval of the PMU within GCD.	Contract specifications PRC Law: 49-'91 & Reg. No. 120	Throughout project corridor and all construction sites	During Construction	Contractor	PMU/GCD
	Rock quarry sites have been located in the feasibility studies. Prior to using these sites the contractor will prepare a conditions of purchase document which will include details on excavation, materials processing, handling, transporting and define how environmental impacts from these actions will be mitigated.	Para. 42 Contract Specifications				PMU/GCD with assistance from GEPB and WRB
	The Contractor shall facilitate inspection of all borrow areas by the GEPB and WRB and satisfy the PMU within GCD of the compliance with the ErPP and EMP. Any non-compliance shall be made good by the Contractor, as directed by the PMU in consultation with the GEPB and WRB, at his own cost. No soil or aggregates will be borrowed or spoil dumped on Cultural Relics sites.	Cultural Relics Protection Law				PMU with assistance from Cultural Relics Department

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
2.1.5 Degradation of Borrow Areas	Borrow pits shall be re-developed as per details found in the Site Operations Plans within the ErPP. Spoils shall be dumped with an overlay of stockpiled topsoil, as per clauses 2.1.1 and 2.1.2, and in accordance with Regulations and the ErPP.	FIDIC: 13.1 FIDIC: 26.1 PRC Law 49-'91 & Regulation No. 120	All borrow areas	During construction	Contractor	PMU/GCD and WRB
2.1.6 Soil Erosion	On road embankment slopes, slopes of all cuts, etc., shrubs and grass will be planted. On sections with high filling and deep cutting the side slopes will be graded and covered with bush and grass, etc., as per specifications for stone pitching, grass and shrub given in the Bid Documents with reference to the ErPP. In borrow pits, the depth of the pits are so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 4 horizontal, from the edge of the final section of bank. The work shall consist of measures as per design, or as directed by the PMU to control soil erosion, sedimentation and water pollution, through use of berms, dikes, sediment basins, fibre mats, mulches, grasses, slope drains and other devices. All temporary sedimentation and pollution control works and maintenance thereof will be deemed as incidental to the earth work and other items of work and, as such, no separate payment will be made for them.	Design requirement Contract Specifications PRC Law: 49-'91 & Reg. No. 120	Within construction corridor and all construction sites; all borrow and spoil areas; service roads and equipment storage sites, etc.	During construction	Contractor	PMU/GCD with assistance from GEPB and WRB.
2.1.7 Contamination of Soil by Fuel and Lubricants	Vehicle/machinery and equipment maintenance and refueling shall be carried out in such a fashion that spillage of fuels and lubricants do not seep into the ground. An "oil interceptor" will be provided for wash down and refueling areas. Fuel storage shall be in properly bunded areas. All spills and collected petroleum products shall be disposed off in accordance with GEPB guidelines.	Contract Terms and Conditions	Throughout Project Corridors, all access roads, sites temporarily acquired and all borrow areas	During construction	Contractor	PMU/GCD with assistance from WRB.

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
	Fuel storage and refilling areas shall be located at least 300m from all cross drainage structures and important water bodies, or as directed by the PMU. In all fuel storage and refueling areas, particularly if located on agricultural land or areas supporting vegetation, topsoil shall be stripped, stockpiled and returned after cessation of such storage and refueling activities as per clause 2.1.2. Oil traps will be provided for service areas, toll station administration areas, parking areas and within drainage systems for bridges over major rivers.	FIDIC: 19.1(c) Para 53				
2.1.8 Contamination of Soil by Construction Wastes	All spoils shall be disposed off in the manner as specified in clause 2.1.1. No new disposal site shall be created as part of the project, which is not treated as per clause 2.1.2 (a & b), except with prior and express approval of the PMU in the course of the project. All waste material shall be completely disposed of as defined and the site shall be fully cleaned before handing over. This will be certified by the GEMS for the GCD. All temporary acquired land shall be dealt in the manner as per clause 2.1.7 if dumping of waste is envisaged. Any claim arising out of waste disposal shall be made good by the contractor, at his cost.	FIDIC: 32.1	Throughout project corridors, all access roads, sites temporarily acquired and all borrow and spoil areas	During construction	Contractor.	PMU/GCD with assistance from GEPB and GEMS
2.2 Water						
2.2.1 Loss of Water Sources	Any source of water (potable or otherwise) for the community such as wells, ponds or tube-well, etc., incidentally lost shall be replaced immediately. The location and siting of the replaced source of water shall be as per the design, or as directed by the PMU. In general, there should be only lateral displacement (of the new site from the old); the replacement shall be ready prior to demolition/ dismantling of the existing source.	RP requirement	Throughout project corridors, all access roads, sites temporarily acquired and all borrow areas	Whenever encountered during construction	Contractor	PMU/GCD and County WRB

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
2.2.2 Flooding	In addition to the design requirements for peak flood levels, the contractor shall take all desired measures, and as directed by the PMU, to prevent temporary or permanent flooding of the site or any adjacent area: including prevention of loss of use, loss of access of any land or property thereon resulting from flowing or stagnant water as direct/ indirect impact of construction.	FIDIC: 19.1(c) FIDIC: 29.1 Contract terms and conditions	Throughout project corridors, all access roads, sites temporarily acquired and all borrow areas	During construction and the defects liability period	Contractor	PMU/GCD
2.2.3 Siltation into Water Bodies	Siltation of soil into the water bodies will be prevented as far as possible. The contractor will take all reasonable measures as per clause 2.1.6 Construction materials containing fine particles shall be stored in such a way that sediment laden water does not drain (at least directly) into nearby watercourses. Coffer dams will be constructed prior to bridge footings or pile drilling commencing in any major water course.	FIDIC:19.1(c) Para 50	Throughout project corridors, all access roads & temporary sites	During construction	Contractor	PMU/GCD with assistance from GEMS
2.2.4 Erosion and siltation	No tree or vegetation other than those approved for removal by the Forestry Dept. will be cut. Revegetation shall be immediate. While earth is bare, the contractor shall take all necessary precaution to prevent water pollution (due to siltation and increase of turbidity).	FIDIC: 19.1 (c) PRC Law: 49-'91 & Regulation No. 120	Throughout project corridors, all access roads & temporary sites	During construction	Contractor	PMU/GCD with assistance from GEPB and GEMS
2.2.5 Alteration of Drainage	(a) In sections along watercourses, and close to cross-drainage channels, earth, stone or any other construction materials or appendage shall be properly disposed of so as to not block the flow of water. All necessary measures shall be taken to prevent earthwork, stonework, materials and appendage as well as the method of operation from impeding cross-drainage at rivers, streams, water canals and existing irrigation and drainage systems.	FIDIC: 19.1 (c) Para. 52	Throughout project corridors, all access roads, sites temporarily acquired and all borrow areas	During construction	Contractor	PMU/GCD with assistance from GEPB

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
2.2.6 Ground Water Depletion	Given the karst geology, underground rivers, etc., groundwater is often found in underground reservoirs. Prior to any cut excavations these water supplies will be identified and avoided. If groundwater supplies are found re-routing of the flow by piping or cessation of leakage by sealing the surface area of the cavity with concrete will occur immediately to prevent leakage or contamination.	Contract specifications Paras 47 and 48	As per Drainage Design	During construction	Contractor	PMU/GCD and GEPB
2.2.7 Contamination of Water from Construction Wastes	All measures will be taken to prevent the wastewater produced in construction from entering directly into streams, water bodies or the irrigation system, as directed by the PMU. Construction work close to the streams or water bodies shall be avoided during heavy rain periods and measures as per clause 2.2.3 will be taken. The discharge standards promulgated under PRC regulation GB: 8978-1996 shall be strictly adhered to and project wastes are to be disposed off in a manner acceptable to the GEPB and PMU, such as the use of sediment tanks during construction. Temporary irrigation and drainage systems should be built before the permanent drainage system construction starts.	FIDIC: 19.1 (c) FIDIC: 26.1 GB: 8978-1996	Throughout Project Corridors, all access roads, sites temporarily acquired and all cut/borrow sites.	During Construction.	Contractor.	PMU/GCD with assistance from GEPB.
2.2.8 Contamination from Fuel and Lubricants	The work shall be carried out in such a manner that pollution of natural watercourses, ponds, tanks and reservoirs is avoided. Vehicle, machinery and equipment maintenance and refueling shall be done in a manner as specified in clause 2.1.7 to prevent pollution to water. Waste pollution products must be collected, stored and taken to approved disposal sites in compliance with PRC guidelines or any other relevant laws, and to the satisfaction of the PMU.	FIDIC: 19.1 (c) FIDIC: 26.1	Throughout Project Corridors, all access roads, sites temporarily acquired and all cut/borrow sites	During construction	Contractor	PMU/GCD with assistance from GEPB.

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
2.2.9 Sanitation and Waste Disposal In Construction Camps	Construction of laborers' camps shall be located at least 200m away from the nearest habitation. The sewage system for the construction laborers' camps shall be properly designed, built and operated so that pollution to ground or adjacent water bodies/ watercourses does not take place. Garbage bins shall be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner, to the satisfaction of the relevant norms and the CPE and the PMU. Arrangements for proper disposal of excreta must be made by the Contractor, and should include, where possible, pick up and disposal by local people. All such arrangements will be directed by the PMU and the CPE.	FIDIC: 19.1(c) FIDIC: 26.1	All Construction Workers Camps	During establishment, operation and dismantling of such camps	Contractor	PMU/GCD and GEPB
2.3 Air Pollution						
2.3.1 Generation of Dust	All vehicles delivering granular and/or fine materials to the site shall be covered to avoid spillage. Material storage site should be 300m away from the residential area and covered with canvas or sprayed with water if possible and feasible. Water will be sprayed on the construction sites and major feeder roads twice a day during dry season. All existing highways and roads used by vehicles of the contractor, or any of his sub-contractor or supplies of materials or plant and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres. Clearance shall be effected immediately and all dust, mud and other debris shall be removed completely.	FIDIC 19.1(c)	Throughout project corridors, all access roads, sites temporarily acquired and all borrow areas	During construction	Contractor	PMU/GCD with assistance from GEPB and GEMS

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
	Plants, machinery (rock crushing) and equipment shall be so handled (including dismantling) so as to minimize the generation dust. All earthworks shall be protected in a manner to minimize the generation of dust. The concrete batching plants shall be sited at least 500m from the nearest habitation and fitted with dust extraction units in compliance with PRC and GZARG standards. Where practical dust screening vegetation will be planted along perimeter of all existing roadside crushers.					
2.3.2 Emission from Construction Vehicles, Equipment and Machinery	The discharge standards promulgated under the Environment Protection Law, 1989 shall be strictly adhered to. All vehicles, equipment and machinery used for construction shall confirm to the relevant PRC standards. All vehicles, equipment and machinery used for construction shall be regularly maintained and correctly operated (including the use of dust filters or hoods) to ensure that pollution emission levels comply with the relevant regulations, namely PRC - GB: 14761.7-93.	PRC - GB: 14761.7-93	Throughout project corridors, all access roads, sites temporarily acquired and all borrow areas	During construction	Contractor	PMU/GCD with assistance from GEPB and GEMS.
2.4 Noise Pollution						
2.4.1 Noise from Vehicles, Plants and Equipment.	The plants and equipment used in construction (including the aggregate crushing plant) shall strictly conform to the PRC and local noise standards, i.e. GB 12523-90 by applying good preservation and maintenance practices at all times At construction sites within 1 km of the nearest habitation, noisy construction work such as crushing, concrete mixing and batching, mechanical compaction, etc., will be stopped between 2000 hours to 0600 hours. In silence zones (areas up to 200m	FIDIC: 19.1 (c) PRC-GB: 12523-90 FIDIC: 26.1 FIDIC: 19.1 (c) FIDIC: 45.1	Throughout project corridors, all access roads, sites temporarily acquired and all borrow areas	During construction	Contractor	PMU/GCD with assistance from GEPB and GEMS

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
	around such premises as hospitals, educational institutional and courts) no hot-mix batching or aggregate crushing plant will be allowed. Workers will be requested to wear helmets and earplugs when operating loud machinery. Interference with teaching activities will be minimized at schools within 400m from construction activities by consultation with teachers in order to ensure a suitable time is selected for operating loud machinery.					
2.4.2 Noise from Blasting or Pre-splitting Operations	Blasting shall be carried out only with permission of the PMU. All the statutory laws, regulators, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed and during fixed hours (preferably during mid-day), as permitted by the PMU. The timing should be made known to all the people within 500m (200m for pre-splitting) from the blasting site in all directions. Blasting mats will be used to reduce noise levels when blasting is carried out.	Para. 62	All blasting sites (Cuts, rock quarries etc.)	During preparation, operation and closure of such sites	Contractor	PMU/GCD with assistance from GEPB and GEMS
2.4.3 Erection of Noise Attenuation structures	Noise barriers at sensitive sites, as nominated in the EIA in Tables 1-10 and 1-11, shall be constructed and finalized prior to the operation of the Highway. Noise attenuation structures such as walls, earthen mounds, double glazing of windows and planting of tree belts shall be completed and inspected by the PMU and GEPB before construction contracts cease.	Para. 66	At nominated sites as designated in the EIA Tables 1-10 and 1-11	Before closure of the construction sites	Contractor	PMU/GCD with assistance from GEPB.

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
2.5 Impact on Flora						
Loss or Damage of Vegetation	All works shall be carried out in such a fashion so that damage or disruption to the flora is minimized. Trees or shrubs will only be felled or removed if they impinge directly on the permanent works or necessary temporary works with prior approval from the PMU and clearance from the Forestry Dept. It is prohibited to borrow soil from or dump spoil on farmlands directly adjoining the road corridor and outside those nominated in the construction design drawings and ErPP.	Design requirement	Entire project site	During construction	Contractor PMU & Forestry Department	PMU/GCD with assistance from the Forestry Department
2.6 Impact on Fauna						
Loss, Damage to Fauna.	Construction workers shall be instructed to protect natural resources, fauna and flora. Construction workers must not access the Nongbang Nature Reserve without permission from and supervision with the Forestry Dept.	FIDIC: 19.1 (c) Para. 54	Entire Project Area—all sites Nonggang Nature Reserve K115 to K130	During construction	Contractor	CPE and GCD with assistance from the Forestry Department
2.7 Disruption to Users						
Loss of Access	Consultation with Transport & Security Departments will occur to control traffic during construction; To decrease dust and noise and minimize impact on existing transport, haulage routes will be carefully selected; At all times, the Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property accesses connecting the project road. The works shall not interfere unnecessarily or improperly with the convenience of public or the access to, use and occupancy of roads, railways and any other access footpaths to or on all property.	As specified in RP documents FIDIC: 29.1 Para. 68	All project corridors and construction sites	During construction	Contractor	PMU/GCD Transport & Security Department

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
	To avoid peak hours on existing road by drawing up reasonable transport schedules. Traffic wardens will be provided by the contractor to assist in identifying and policing safe crossings of construction sites by vehicles and people.					
2.8 Risks and Toxic Materials						
2.8.1 Use of Hazardous and Toxic Materials	Herbicide or other toxic chemicals shall be used strictly in accordance with the manufacturer's instructions and according to PRC Regulations. The PMU shall be given at least 6 working days notice of the proposed use of any herbicide or toxic chemical. A register of all herbicides and other toxic chemicals delivered to the site shall be kept and maintained up to date by the Contractor.	PRC Regulation: JT3130-88	Entire project site	During construction	Contractor	PMU/GCD with assistance from GEPB.
2.8.2 Construction Safety	Safety markings will be set up on temporary road. Effective safety measures should be taken during blasting. No blasting shall occur during busy hours. When vibration producing construction (such as compaction of piers or operation of vibrating rollers) or blasting is carried out, the impact on neighboring adobe houses will be supervised.	Contractor Terms Para. 62 and 68	Entire project site	During construction	Contractor	PMU/GCD with assistance from GEPB and GEMS Local Bureau of Public Security
2.9 Damage and Loss of Cultural Properties						
2.9.1 Conservation of Religious Structures and Tombs	Impact on cultural properties, which include cultural sites places of worship and graveyards/tombs as identified during detailed design, and by local communities will be protected and respected. Those tombs needing to be moved will be relocated only after consultation and approval of local communities.	FIDIC: 27.1 and Local Edicts	Entire project site	During construction	Contractor	PMU/GCD & County Cultural Relics Bureau
2.9.2 Conservation of Cultural Relics	If potential cultural relics are found during construction, contractors will stop their construction immediately and notify the local Cultural Relics Bureau at once.	PRC Cultural Relics Protection Law	Entire project site	During construction	Contractor	PMU/GCD & County Cultural Relics Bureau and Cultural

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
	Continuation of construction activities in the area the relic was found is forbidden before full identification of the relics can be verified and permission from the Cultural Relics Dept given.					Relics Dept.
3. Operation Phase						
3.1 Spills due to Traffic and Accidents	Emergency Procedures Plans will be prepared and put in for cleaning up of oil, fuel and toxic chemicals spills or for explosions on the Highway. An emergency group will be organized by GEAB to handle any such emergency. Properly trained staff will form this group and toll operators etc will be informed of whom to contact in an emergency. Emergency vehicles capable of controlling emergency situations will be available for the NanYou Expressway.	Para 53	NanYou Expressway	During the operation period of the road	GEAB	GEAB with assistance from GEPB
3.2 Maintenance of Storm Water Drainage System	The drains will be periodically cleared to maintain storm water flow.	Para 53	All Project Corridors, especially the Urban Stretches	Beginning and end of each monsoon	GEAB	GEAB, GCD, County Depts responsible for drainage maintenance
3.3 Atmospheric Pollution from vehicles	The EIA indicated no significant air quality degradation. However: Roadside tree plantations will be maintained. New afforestation projects adjacent to the project road and in the surrounding RoW will be encouraged. The vehicles on the road will be tested ad hoc for emitting pollutants. Those in excess of pollutants will not be allowed to enter the expressway. Air quality monitoring at Biji and Xiashi Villages will be undertaken twice yearly in accordance with the monitoring schedule as set out in Appendix 7.	EIA Paras. 59 and 60	All Project Corridors and nominated villages	Starting Immediately after completion of construction	GEAB GEMS/NEMS	GEPB, GCD GEMS and Police

NEMS=Nanning Environmental Monitoring System.

Environmental Impact/Issue	Mitigative Measures	Reference to SEIA para. & Contract Documents	Location	Time Frame	Responsibility	
					Implementation	Supervision
3.4 Noise Pollution	Noise pollution will be monitored at the 5 sites nominated in the EIA (as per Table 10-B). Based on the results of monitoring noise pollution in the operation phase, sound barriers and other measured will be considered at places with excessive noise. No horn signs should be set at sections near schools. At access points to the expressway random weighing of vehicles will occur to stop and discourage overloaded and unroadworthy vehicles using the expressway. This should stop or at least discourage noisy vehicles on the NanYou Expressway.	Project EIA Impact zone & sites specified in EIA Paras. 63 to 66	Refer Noise Pollution Monitoring Program	Throughout operation phase	GEAB, GEMS/NEMS	GCD, GEPB and GEMS
3.5 Accidents involving Hazardous Materials	Compliance with PRC Regulations: The delivery of hazardous substances will require a permit license, driving license and guidance license. In case of a spill of hazardous materials or an accident involving hazardous substances, the relevant emergency procedures team will be called at once to deal the situation and will implement procedures set out in the emergency procedures plan.	PRC Regulation: JT3130-88 Local Transport Regulation on Hazardous Substances	All project corridors and surrounding		GEAB	GCD, GEPB & Police
3.6 Water Pollution	Domestic sewage at toll stations will be treated by the use of septic tanks, and then used as fertilizer. Garbage will be treated centrally. Oil traps will be monitored regularly.	EIA Para. 53	All service areas and toll gates	Throughout operation phase	GEAB	GEPB, GCD
3.7 Failure to maintain Mitigative Measures	Plantings are particularly susceptible to neglect and as such, planting and maintenance will be contracted to local communities and will be based on trees surviving to maturity (disease excepted).	ErPP	Entire project corridor	To be developed as part of the Detailed Design Activity	Horticulture & Maintenance Department of GEAB Corporations	GCD
4. **Environmental Monitoring**						
	Monitoring will be conducted based on relevant specifications or standards issued by SEPA and using the schedule set out in Table 10-B of the EIA.	EIA, Table 10-B	Monitoring stations selected		GEAB, GEMS/NEMS	SEPA and GCD

SUMMARY RESETTLEMENT PLAN

A. Status of the Resettlement Plan

1. The proposed Project will consist of four main physical works components: (i) construction of about 136 kilometers (km) of expressway from Nanning to Ningming, and about 43 km of class I road from Ningming to Youyiguan, including interchanges, toll stations, bridges, and service areas; (ii) construction of about 49 km of class II connector roads; (iii) construction or improvement of about 100 km of village access roads in the expressway vicinity; and (iv) improvement of approximately 710 km of complementary roads in four counties. Where land may be required for new construction and right-of-way widening, the Guangxi Zhuang Autonomous Region (GZAR) government assures that any resettlement effects will receive the same compensation and other assistance provided in the Resettlement Plan (RP)

2. The Xi'an Highway University prepared a RP in February 2000, based on the preliminary technical design, incorporating the socioeconomic survey and village data collection of impacts. The RP is now being updated to take into account subsequent design modifications requested by the Ministry of Communications (MOC) and recently approved GZAR land administration directives.

B. Scope of Land Acquisition and Resettlement

3. The expressway, connector and link roads will affect 18 townships and 187 villages in 6 counties: Chongzuo, Fushui, Longzhou, Ningming, Pingxian, and Yongning,. According to the initial detailed RP survey, which is being updated based on the changes proposed, nearly 1,306 hectares (ha) of land will be acquired, 58 percent of which is cultivated land, comprising paddy (27 percent), with the remaining 73 percent including dry fields, vegetables, and sugarcane. Other identified assets on the land include telecommunications and electrical infrastructure, ponds for fish and lotus cultivation, sheds, walls, graves, and economic trees. These and other identified assets will all be compensated at replacement value. Approximately 150 ha of land will be borrowed temporarily during the construction phase. Land acquisition will directly affect an estimated 31,000 people in nearly 6,500 households, subject to confirmation. However, given the relatively high farmland per capita ratios, which range from about 0.10 ha per person in Ningming to 0.18 ha per person in Chongzuo, the number of people requiring full economic rehabilitation, defined as losing 25 percent or more of their land, is likely to be less than 10,000.

4. More than 25,000 square meters of structures, including houses, will be demolished, necessitating relocation of about 300 households and 1,350 persons. Since this is an alignment project, these households will generally be moved a short distance to another site within the same administrative village.

C. Policy Framework and Entitlements

5. For people unavoidably affected, the resettlement objective is to achieve equal, or better income and living standards in line with the Country's Land law (1998) and ADB's Policy on Involuntary Resettlement. The Guangxi Communications Department (GCD) will ensure that any people losing land, housing, other assets, or income will be helped to restore their income and living standards. The GZAR in 2000 issued a directive to implement the 1998 Land Law to cover large infrastructure projects, according to which the land compensation will be set at 7 times the annual average output value (AAOV) for cultivated land, and the resettlement subsidy will be 5-11 times the AAOV depending on the average per capita farmland. These rates are

within the range set by the 1998 Land Law. The revised RP will confirm the compensation standards to be applied and will calculate the values for different types of land given AAOVs in the project area. Those people losing land temporarily for borrow sites will receive a payment equivalent to production value foregone, for the period of loss, expected to be 1 to 2 years.

6. The land used temporarily will be restored to the owner in the original condition, or funds will be provided to the owner to restore the land to its original condition. For structures lost, replacement value will be provided to the affected households. Those losing housing will be provided with a free new housing site serviced with road, electricity, and water within their own administrative village. There will be no depreciation for housing and people will be allowed to salvage materials from their old houses.

D. Resettlement Strategy

7. Efforts to minimize resettlement effects resulted from consultations with local officials during the setting of the alignment during the initial feasibility study. The amount of paddy land to be acquired was kept to 27 percent of the total agricultural land lost, while the number of relocated houses was kept to approximately 300. For those unavoidably affected, the resettlement strategy will replace losses of housing, land, other assets, infrastructure, and income.

8. Over 90 percent of those affected are losing agricultural land. Most of these people will be reabsorbed back into agriculture, with the affected villages carrying out a village land adjustment to ensure that village members still have sufficient land to farm. The survey is identifying households that are severely affected because of losing 25 percent of their land or more, and will develop options for improving livelihoods on readjusted agricultural land. These options include the use of cash compensation to enhance irrigation facilities and extend the quantity of higher producing paddy land, and the purchase of more productive crop varieties, for example, sugarcane and marketable tree products such as star anise. Expressway contractors will be asked to give priority to resettlement affected households in the allocation of unskilled jobs during construction by consulting with the township and village leaders.

9. The GCD will ensure that the resettlement entitlements are provided to the people affected before the ground leveling and demolition commence. Land compensation and resettlement subsidy will be paid to the villages affected. Hosing compensation and compensation for young crops and other assets will be provided directly to people losing those assets. Compensation for infrastructure such as electrical and communication fixtures will be paid to the concerned department.

E. Institutional Arrangements

10. The GZAR government will assume responsibility for implementing the resettlement according to the agreed RP. A project management unit (PMU) within GCD will have responsibility to co-ordinate the planning, implementation, financing, and reporting of land acquisition and resettlement for the expressway link and connector roads. The GCD is responsible for any land acquisition and resettlement for the complementary roads. Leading groups for resettlement, each comprising 10 staff, will be established within the affected counties. The county offices will take the primary responsibility for the resettlement consultation, implementation, and timely delivery of entitlements.

F. Vulnerable Groups

11. During the survey update before appraisal, the survey team will identify vulnerable households, including those living below the poverty line, the five-guarantee households, and households headed by women. Vulnerable households affected will receive special attention in the restoration of livelihood, for example, through preferential unskilled labor opportunities, providing they meet the other recruitment criteria. Those losing housing will also receive village assistance to construct a new house. They are also eligible for any ongoing welfare support to which they are already entitled from the village or the Civil Affairs Bureau.

G. Consultation and Grievance Redress

12. The 1998 Land Law provides for disclosure and consultation with people affected. Some of the people affected have been notified about the key elements of the RP during meetings and interviews. Further consultations will include meetings, arranged by township and village officials, on the specific impacts to be felt in each area and how they will be addressed. The people losing housing will have be offered a choice of housing sites; and those losing agricultural land will have the opportunity to consider suitable income replacement alternatives.

13. Prior to appraisal (April 2001) the RP will be disclosed to the people affected, through the peasant economic collectives, in the form of an information booklet. This will contain the key information such as the resettlement scope; expected time frame; compensation rates for land and other assets; other assistance to replace assets, housing, and incomes; and the grievance redress mechanisms. The county, township, and village officials will ensure that any concerns raised by the people affected are addressed.

14. In case of a grievance, people affected will submit their oral or written complaint first to the village committee or the township resettlement office. If presented orally, the village committee must write it down. If their complaint is not settled in two weeks, they can seek redress at the county resettlement office, within one month. If still unresolved within two weeks the PMU will try to achieve a solution. The final redress would be sought, if necessary, in the civil courts, in accordance with the Civil Procedures Act.

H. Monitoring and Reporting

15. A monthly reporting system is being established in the PMU. The detailed plan for internal and external monitoring and evaluation is currently being developed. GCD will engage the services of a qualified independent social research agency, with experience in resettlement assessments, to conduct independent resettlement monitoring and evaluation. The purpose of this is to assess the extent to which the people affected have received their entitlements on time, as well as to ascertain the extent to which the resettlement objectives of full restoration of incomes and living standards have been achieved. The monitoring and evaluation method will include the conduct of a baseline study, to be followed by periodic survey updates at the end of years 1 and 2 and again after project completion. The survey will be conducted using household questionnaires, on a statistically valid sample of those affected. The survey will include a significant number of those severely affected by loss of land, as well as those losing housing, and will also allow identification of the effects on the poor and vulnerable.

16. The PMU will report to ADB on progress in land acquisition and resettlement through quarterly progress reports, and will submit the periodic reports from the independent monitoring and evaluation agency.

I. Finance and Implementation Schedule

17. The preliminary RP budget estimate, which is subject to confirmation in the revised RP, is Y303 million, for all costs including compensation; resettlement subsidy; payments for other assets such as housing, and fees; and monitoring and evaluation. Annual adjustments in the cost estimates, including compensation rates, will be made based on the inflation rate for the previous year. GCD will undertake to supplement the resettlement budget, as may prove necessary, to meet any shortfall that emerges in achieving the resettlement objectives. The implementation schedule is being updated for the revised RP.

COSTS OF ENVIRONMENTAL MITIGATION MEASURES

Table A6.1: Estimated Nonrecurring Costs for Project (Yuan)

Protection Measure	Item	Total Costs	2000 Costs	2001 Costs	2002 Costs	2003 Costs	2004 Costs
Environmental design and assessment[1]	Environmental data gathering, Production of EIA, design of engineering factors	600,000	600,000				
Preparation of environmental Plan[2]	Soil Erosion Protection Plan	600,000		600,000			
	Mitigation Measures Execution Plan	100,000		100,000			
Plantation along highway including slope cover [3]	Trees and grass at 80,000 per km for 183.5 km	14,680,000				7,340,000	7,340,000
	Trees and Grassing on Connecting Lines for 47.5 km @ Y80,000 per km	3,800,000				1,900,000	1,900,000
Noise protection measures [3]	Sound Barriers for 160 m^2 @ Y500/m^2	335,000					335,000
	Protection of toll stations/management center – air conditioning and sound proofing	400,000					400,000
Soil conservation [3]	Settlement tanks during construction 50 @ Y10,000	500,000		250,000	250,000		
	Borrow sites and spoil sites erosion protection and site restoration	3,020,000		755,000	755,000	755,000	755,000
Dust control [4]	Spraying sites 1,460 days @ Y600 per day – once per day for 4 years construction	876,000		219,000	219,000	219,000	219,000
Safety signs during construction[4]		10,000		10,000			
Recovery of local road[4]	From damage by construction vehicles	200,000					200,000
Water treatment facilities [3]	At toll gates – one septic tank per toll station at Y10,000 per station for nine stations and one at the management center	100,000					100,000
	At service areas (3) and including vegetation @ Y50,000 per station	150,000					150,000
	At work camps (12 camps, 1 septic tank per camp)	240,000		240,000			
Training of personnel[2]	From highway construction units, management units, emergency units	440,000		440,000			
	From environmental protection units	520,000		520,000			
Monitoring	For water, noise, and air quality monitoring	400,000		100,000	100,000	100,000	100,000
Safety wardens [3]	During construction – 20 persons for 4 years	200,000		50,000	50,000	50,000	50,000
Protection of cultural relics	Survey of cultural relics	100,000		100,000			
Contingency	Accident plan preparation	1,572,000		1,572,000			
TOTAL		**29,068,000**					

[1] Already spent
[2] Included in Other Consulting Services Costs.
[3] Included in Environmental Protection in Contract Costs
[4] Included in Other Contract Items

Table A6.2: Estimated Recurring Costs During Construction
(Yuan)

Protection Measure	Item	Total Costs	2001 Costs	2002 Costs	2003 Costs	2004 Costs
Monitoring of environment[1]	Air quality at 6 sites (concrete batching sites/labor camp) and 2 additional sites on unpaved road – near villages. Done once every 2 months @ Y300 per sample for 4 years.	108,000	27,000	27,000	27,000	27,000
	Noise at locations where construction sites are within 200 m of residential areas or other sensitive sites for 14 identified sites once a month at Y80 a sample. Likely to be 7 sites at any one-month period during a four-year period.	46,080	11,520	11,520	11,520	11,520
	Water monitoring – at Wangzhuang River (K32), water course flowing from Kelan Reservoir to the Zuojiang River (K70) and Mingjiang River (K130) each twice a year at Y200 per sample for a four year period	4,800	1,200	1,200	1,200	1,200
Maintenance of septic tanks [2]	Maintenance of 12 septic tanks at Y2,000 per year for 4 years	96,000	24,000	24,000	24,000	24,000
Environmental management [1]	Supervision of each section at Y10,000 per section per year	480,000	120,000	120,000	120,000	120,000
	General Running Costs @ Y100,000 per year	400,000	100,000	100,000	100,000	100,000
TOTAL		**1,134,880**				

[1] Included in Other Consulting Services Costs.
[2] Included in Environmental Protection in Contract Costs.

Table A6.3: Estimated Recurring Costs Per Year During Operation
(Yuan)

Protection Measure	Item	Cost	20 years
Annual maintenance cost	For protection of environmental facilities	50,000	
Annual monitoring cost	Air quality at 2 times per year for 2 days each at one location	100,000	
	Noise monitoring at 4 locations twice a year; and water quality at 2 locations twice a year including reporting		
Environmental treatment	From monitoring of results	300,000	
Training	Up-dating on environmental procedures	10,000	
EMP staff salaries	10 staff at Y8,000 for maintenance	80,000	
	4 staff at Y20,000 for supervision	80,000	
TOTAL		**620,000**	**12,400,000**

EMP=Environmental Monitoring Program.

Appendix 7

ENVIRONMENTAL MONITORING PROGRAM DURING CONSTRUCTION (2001-2004) AND OPERATION (2005-2025)

Item	Monitoring Details	Timing	Executing Unit	Reporting
Construction Period				
Construction Noise	Measure construction noise at varying distances from sources and near sensitive structures (schools) and residential areas within 400m of active construction sites	Measure/inspect once a month	GEMS/NEMS	In Monitoring Report every 4 months to GCD & GEPB
Air Quality	Measure in the area around construction equipment sources and at prescribed sensitive receptors (schools and villages within 400m) of active construction sites	Measure once every two months	Same as above	same as above
Water Quality	Monitor at Wangzhuang River (K32), water course flowing from Kelan Reservoir to the Zuojiang River (K70) and Mingjiang River (K130)	Measure twice yearly	Same as above	same as above
Erosion protection	Inspect whether erosion control measures are in place and functioning as specified in the ErPP	Inspect sites according to contract schedule	PMU and WRB	same as above
Sewage treatment	Inspect sewage treatment systems or other non-polluting waste disposal system—as per contract	Inspect once a month	PMU and GEMS	same as above
Dust Suppression	Inspect if dust suppression is maintained and is effective at specific point sources (e.g., batch plant)-according to contract and water spraying of sites during dry season.	same as above	PMU and GEMS	same as above
Construction Area Clean up	Inspect all construction sites re: oil, grease & fuel management, waste management, and hazardous and chemical materials storage	same as above	PMU and GEPB	same as above
Operational Period				
Noise	Monitoring day time and night time noise levels at Tanxue, Xiashi, Biji village, Aikou, and Xincun Villages.	Twice each year	GEMS/NEMS	Annual Monitoring Report to GCD, GEPB, and municipal, county, village heads
Air	Monitoring at Biji village and Xishi village for TSP and NO_x.	Twice each year (Summer and Winter)	GEMS/NEMS	same as above
Sewage and Water	Monitoring the sewage discharge from septic tanks in service areas, toll stations and administration buildings.	Twice a year (dry and wet season)	GEMS/NEMS	same as above
	Mingjiang River and Tangpeng Reservoir			
Soil Conservation	Monitoring of vegetation of slopes, clearance of drainage ditches and compliance with Environmental Impact Assessment and Summary Environmental Impact Assessment.	Twice a year	County Erosion Protect. Dept. of WRBs	Annual Monitoring Report to GCD
Trees	Reforestation program to be monitored to determine compliance and maintenance, in terms of numbers and tree survival	Once per year, starting 6 months after planting for 4 years	GEAB Maintenance Department and Forestry Department	Annual Monitoring Report to GCD

ErPP=Erosion Protection Plan, GEAB=Guangxi Expressway Administration Bureau, GEMS=Guangxi Environmental Monitoring Station, GEPB=Guangxi Environmental Protection Bureau, GCD=Guangxi Communications Department, NEMS=Nanning Environmental Monitoring Station, NO_x=nitrogen oxide, PMU=Project Monitoring Unit, TSP=total suspended particular, WRB=Water Resource Bureau.