



# Completion Report

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Project Number: 35338  
Loan Number: 2089  
June 2012

## People's Republic of China: Hunan Roads Development II Project

Asian Development Bank

## CURRENCY EQUIVALENTS

Currency Unit – yuan (CNY)

		<b>At Appraisal</b> (15 August 2004)	<b>At Project Completion</b> (6 May 2011)
CNY1.00	=	\$0.1210	\$0.1540
\$1.00	=	CNY8.2700	CNY6.4931

## ABBREVIATIONS

ADB	–	Asian Development Bank
CECC	–	Changji Expressway Construction and Development Company
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
FIRR	–	financial internal rate of return
GDP	–	gross domestic product
HECC	–	Hunan Expressway Construction and Development Company
HPEMB	–	Hunan Provincial Expressway Management Bureau
HPTD	–	Hunan Provincial Transportation Department
ICB	–	international competitive bidding
M&E	–	monitoring and evaluation
O&M	–	operation and maintenance
PRC	–	People's Republic of China
SEPP	–	soil erosion protection plan
TA	–	technical assistance
VOC	–	vehicle operating cost
WACC	–	weighted average cost of capital

## WEIGHTS AND MEASURES

km	–	kilometer
m <sup>2</sup>	–	square meter
m <sup>3</sup>	–	cubic meter
MTE	–	medium truck equivalent
<i>mu</i>	–	Chinese unit of measurement (1 <i>mu</i> = 666.67 m <sup>2</sup> )
pcu	–	passenger car unit

## NOTE

In this report, "\$" refers to US dollars, unless otherwise stated.

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## BASIC DATA

### A. Loan Identification

1.	Country	People's Republic of China
2.	Loan Number	2089
3.	Project Title	Hunan Roads Development II Project
4.	Borrower	People's Republic of China
5.	Executing Agency	Hunan Provincial Transportation Department
6.	Amount of Loan	\$312.5 million
7.	Project Completion Report Number	PRC 1323

### B. Loan Data

1.	Appraisal	
	– Date Started	8 May 2004
	– Date Completed	14 May 2004
2.	Loan Negotiations	
	– Date Started	9 August 2004
	– Date Completed	13 August 2004
3.	Date of Board Approval	9 September 2004
4.	Date of Loan Agreement	26 May 2005
5.	Date of Loan Effectiveness	
	– In Loan Agreement	24 August 2005
	– Actual	16 August 2005
	– Number of Extensions	0
6.	Closing Date	
	– In Loan Agreement	30 June 2010
	– Actual	6 May 2011
	– Number of Extensions	1
7.	Terms of Loan	
	– Interest Rate	ADB's London interbank offered rate (LIBOR) based lending facility
	– Maturity	25 years
	– Grace Period	5 years
8.	Terms of Relending	
	– Interest Rate	ADB's LIBOR based lending facility
	– Maturity	25 years
	– Grace Period	5 years
	– Second-Step Borrower	Hunan provincial government

## 9. Disbursements

## a. Dates

<b>Initial Disbursement</b>	<b>Final Disbursement</b>	<b>Time Interval</b>
1 September 2005	6 December 2010	63 months
<b>Effective Date</b>	<b>Original Closing Date</b>	<b>Time Interval</b>
16 August 2005	30 June 2010	59 months

## b. Amount (\$ million)

<b>Category</b>	<b>Original Allocation</b>	<b>Last Revised Allocation</b>	<b>Amount Canceled</b>	<b>Net Amount Available</b>	<b>Amount Disbursed</b>
Expressway civil works	256.76	272.62	0.00	272.62	272.62
Local roads	12.50	12.50	(0.07)	12.57	12.57
Equipment	8.81	8.81	0.26	8.55	8.55
Consulting services and training	1.69	1.51	0.02	1.49	1.49
Interest during construction and commitment charge	9.56	17.06	0.00	17.06	17.06
Unallocated	23.18	0.00	0.00	0.00	0.00
<b>Total</b>	<b>312.50</b>	<b>312.50</b>	<b>0.21</b>	<b>312.29</b>	<b>312.29</b>

( ) = amount increased.

Source: Asian Development Bank.

**C. Project Data**

## 1. Project Cost (\$ million)

<b>Cost</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Foreign Exchange Cost	314.17	312.29
Local Currency Cost	463.93	677.43
<b>Total</b>	<b>778.10</b>	<b>989.72</b>

## 2. Financing Plan (\$ million)

<b>Cost</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Implementation Costs		
Borrower Financed	436.29	651.09
ADB Financed	304.60	295.23
<b>Total</b>	<b>740.89</b>	<b>946.32</b>
IDC Costs		
Borrower Financed	27.65	26.34
ADB Financed	9.56	17.06
<b>Total</b>	<b>37.21</b>	<b>43.40</b>

ADB = Asian Development Bank, and IDC = interest during construction and commitment charge.

Source: Asian Development Bank.



## 3. Cost Breakdown by Project Component (\$ million)

Component	Appraisal Estimate	Actual
<b>A. Base Cost</b>		
1. Expressway civil works	496.30	721.02
2. Equipment	8.81	13.73
3. Land acquisition and resettlement	46.00	62.19
4. Consulting services and training	35.82	45.32
5. Local roads	81.86	104.06
<b>Subtotal (A)</b>	<b>668.79</b>	<b>946.32</b>
<b>B. Contingencies</b>		
1. Physical contingencies	42.81	0.00
2. Price contingencies	29.28	0.00
<b>Subtotal (B)</b>	<b>72.09</b>	<b>0.00</b>
<b>C. Interest during construction and commitment charge</b>	<b>37.21</b>	<b>43.40</b>
<b>Total</b>	<b>778.10</b>	<b>989.72</b>

Note: Numbers for appraisal estimate may not sum precisely because of rounding.  
Source: Asian Development Bank.

## 4. Project Schedule

Item	Appraisal Estimate	Actual
Completion of Detailed Designs	December 2003	December 2003
Date of Contract with Consultants	September 2005	September 2005
Civil Works Contract		
Date of Award	September 2005	August 2005
Completion of Work	December 2008	December 2008
Equipment and Supplies		
Dates		
First Procurement	July 2007	May 2008
Last Procurement	July 2007	May 2008
Completion of Equipment Installation	December 2008	December 2008
Start of Operations		
Trial Operation of Expressway	December 2008	December 2008
Full Completion and Operation of Expressway	December 2012	

Source: Asian Development Bank.

## 5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 1 September 2004 to 31 December 2004	Satisfactory	Satisfactory
From 1 January 2005 to 31 March 2005	Satisfactory	Satisfactory
From 1 April 2005 to 30 April 2005	Satisfactory	Unsatisfactory <sup>a</sup>
From 1 May 2005 to 31 December 2005	Satisfactory	Satisfactory
From 1 January 2006 to 31 December 2006	Satisfactory	Satisfactory
From 1 January 2007 to 31 December 2007	Satisfactory	Satisfactory
From 1 January 2008 to 31 December 2008	Satisfactory	Satisfactory
From 1 January 2009 to 31 December 2009	Satisfactory	Satisfactory
From 1 January 2010 to 31 December 2010	Satisfactory	Highly Satisfactory

<sup>a</sup> The *unsatisfactory* rating was caused by a 7.7 month delay in loan signing.

Source: Asian Development Bank.

**D. Data on Asian Development Bank Missions**

<b>Name of Mission</b>	<b>Date</b>	<b>No. of Persons</b>	<b>No. of Person-Days</b>	<b>Specialization of Members<sup>a</sup></b>
Fact-finding	5–13 November 2003	4	34	a, b, c, d
Appraisal	8–14 May 2004	7	42	a, b, d, e, f, g, h
Inception	2–4 December 2005	3	12	i, j, k
Review 1 <sup>b</sup>	16–20 May 2006	5	20	i, j, k, l
Review 2	10–14 September 2007	3	15	k, l, o
Midterm review	23–29 April 2008	4	26	k, l, m, o
Review 3	11–15 May 2009	2	10	k, j
Review 4	29 June–2 July 2010	3	15	k, l, j
Project completion review	21–25 November 2011	5	22	k, l, m, n, j

<sup>a</sup> a = project economist, b = transport specialist, c = financial specialist, d = resettlement specialist, e = project engineer, f = young professional, g = environmental specialist, h = principal counsel, i = project specialist, j = associate project analyst, k = project officer, l = resettlement officer, m = financial management officer, n = environment officer, and o = assistant project analyst.

<sup>b</sup> Project administration was transferred to the ADB Resident Mission in the People's Republic of China on 20 May 2006.

Source: Asian Development Bank.

## **I. PROJECT DESCRIPTION**

1. With the rapid economic growth that has taken place in the People's Republic of China (PRC) since the 1980s, vehicle ownership and demand for road transport infrastructure has substantially increased. Fast growth and structural change in the economy and efforts to reduce imbalances in economic development between coastal provinces and inland regions have resulted in factors of production being shifted from coastal regions to the interior. In this way, labor-intensive industries are being relocated inland, which has generated strong demand for the least-cost and direct flow of freight and traffic between two regions. In 2000, the volume of road freight transport was 597.3 billion ton-kilometers (km) and the volume of passenger transport was 660.0 billion passenger-km. In 2010, the volume of road freight transport had increased to 4,339.0 billion ton-km and passenger transport to 1,502.1 billion passenger-km. Since 2009, the PRC has displaced the United States as the world's largest automotive market, with 13.6 million vehicles sold in 2009, 17.6 million in 2010, and 18.5 million in 2011. To cope with the fast-growing vehicle numbers in both urban and rural areas, increasing traffic pressure on the existing road network, growing demand for better roads, and the anticipation of higher transport service levels, the government initiated a long-term strategy in 1988 to implement a 35,000 km national trunk highway system. By 2004, this strategy had further evolved into a plan for a national expressway network with a total length of 85,000 km, which was targeted for full completion by 2020. When this expressway network is completed, all major economic centers and municipalities will be connected by expressways, and supplemented by a countrywide local road network.

2. Asian Development Bank (ADB) assistance in the road sector has supported the government's efforts to expand and improve national and local road networks. To meet the growing demand for transport infrastructure and services, from 2006 to 2011 the government mobilized CNY5,313.2 billion from its budget, domestic funds, and external sources to build new roads and improve the deteriorated highway network. By the end of 2011, the total road network in the PRC was 4,019,100 km, consisting of 85,000 km of expressways, 64,400 km of class I highways, 308,700 km of class II highways, 388,000 km of class III highways, 2,469,500 km of class IV highways, and 703,500 km of under-class highways. However, the PRC's road network density is 41.75 km per 100 square kilometers, which is about half that of the United States and one-eighth that of Japan. The government's policy for the road sector, as reflected in its Twelfth Five-Year Plan for 2011–2015, includes (i) expansion of the scale of the road network with improved quality and technical standards, and a total highway mileage of 4.5 million km; (ii) an expressway length of 108,000 km, with 90% of the cities above 200,000 residents to be connected to the national expressway network; (iii) increased class II and above technical standard roads to 650,000 km; and (iv) a total rural road length of 3.9 million km.

3. Hunan province ranked only 21st among 31 mainland provinces and municipalities in 2000 in terms of gross domestic product (GDP) per capita. However, with the rapid economic development in the 1990s and 2000s in the PRC, Hunan has improved its standing: CNY5,425 in 2000 (69% of the national average GDP per capita), CNY10,562 in 2005 (74%), and CNY24,719 in 2010 (82%). Hunan is a landlocked province in the interior of the PRC. It is bordered by Jiangxi to the east, Guangxi and Guangdong to the south, Hubei to the north, and Chongqing and Guizhou to the west. Several major highway corridors and railway lines have been built since the 1990s, linking with the northern, southern, and eastern neighboring provinces. In addition, an initiative on inland waterway transportation was launched to improve waterway navigation conditions. However, up until the early 2000s, the sole major road linking the western part of province to the PRC's western regions was badly deteriorated. It became a bottleneck that constrained interprovincial traffic movement and hindered economic growth in

the western part of the province. The national highway which ran parallel to the project expressway and served as a trunk route to major western destinations such as Chongqing and Chengdu was of a combination of technical standard class III and IV. It mostly had two lanes with a total width of 7–9 meters, its pavement was rough and in poor condition, and two-thirds of the road suffered from frequent congestion.

4. In the early 2000s the government determined that an improved transport corridor passing through the western part of Hunan province connecting with developed areas and economic centers was a top priority. At project appraisal, 1.9 million people, around 42% of whom were ethnic minorities, would directly benefit from the project. About 49% of the 1.3 million rural beneficiaries and 15% of the 573,000 urban beneficiaries were poor. One of the reasons for the high poverty incidence was the geographical isolation and the high cost of motorized transportation; most farmers in the mountainous poor villages did not have adequate access to markets and had limited mobility beyond their immediate communities. Inadequate road access was also an impediment to higher agricultural productivity and prevented poor people from taking advantage of job opportunities in the towns. Despite considerable investment, the road network was inadequate and did not provide efficient access to large parts of the province and neighboring economic centers. Better transport links were vital to improve economic efficiency, promote domestic and international trade, and contribute to poverty reduction.

5. The principal objective of the project was to facilitate efficient, sustainable economic growth and thus contribute to poverty reduction in Hunan. The project was designed to (i) improve economic efficiency, foster trade, and facilitate interregional integration by alleviating congestion, reducing vehicle operation costs (VOCs), and improving traffic safety; (ii) provide a missing link in the Changsha–Chongqing western development corridor; (iii) expand the economic and social benefits over a wider cross-section of the local communities by improving accessibility for the rural poor in the corridor; and (iv) improve people's incomes and well-being. The project framework is in Appendix 1.

6. In 2002, a feasibility study for the project was prepared by the Hunan Provincial Communications Department, and was approved by the government in July 2003.<sup>1</sup> ADB approved project preparatory technical assistance (TA) on 23 September 2002 to review and assess the project's technical feasibility and financial viability, including its environmental and resettlement impact. The TA was completed in November 2003, and its outcome confirmed the technical, financial, and economic viability of the project and the adequacy of its environmental and social measures. Subsequently, the loan fact-finding and appraisal missions verified that the project was in line with ADB's country operational strategy and sector policy.<sup>2</sup> ADB's Board of Directors approved a loan of \$312.5 million for the project on 9 September 2004. The loan became effective on 16 August 2005 and had an original closing date of 30 June 2010. The closing date was extended to 31 December 2010 to enable completion of one local road and overseas training and the loan account was closed on 6 May 2011. Appendix 2 provides a chronology of major events.

7. At appraisal, the project comprised (i) construction of a 173 km, four-lane, access-controlled toll expressway from Changde to Huaihua, including tunnels, bridges, interchanges,

<sup>1</sup> The Hunan Provincial Communications Department was renamed the Hunan Provincial Transportation Department (HPTD) on 1 June 2009.

<sup>2</sup> ADB. 1997. *Country Operational Strategy Study: People's Republic of China*. Manila; ADB. 2001. *Country Strategy and Program Update: People's Republic of China, 2002–2004*. Manila.

toll stations, and service areas; (ii) upgrade or improvement of 517 km of local roads, thereby providing improved access to 404 villages; (iii) procurement of equipment for road maintenance and safety, toll collection, surveillance and communications, tunnel ventilation and lighting, vehicle axle road testing, and environmental protection; (iv) land acquisition and resettlement; and (v) consulting services for construction supervision, safety audits, monitoring and evaluation, and capacity building.

## **II. EVALUATION OF DESIGN AND IMPLEMENTATION**

### **A. Relevance of Design and Formulation**

8. ADB's country strategy for the PRC's road sector at the time of appraisal supported (i) the construction of roads that connect major coastal growth centers with the interior regions; (ii) the integration of the road network so that the national trunk highway system is supported by a system of local roads, particularly those that provide access to poor areas; (iii) the promotion of road safety; (iv) institutional strengthening to increase financial and managerial efficiency in the expressway operation; (v) the adoption of appropriate pricing policies to optimize road transport capacity; and (vi) the use of alternative methods of investment financing. The strategy aimed to foster economic development in the western region and minimize development gaps between the western and coastal regions. The road sector is thus an important part of the strategy of strengthening economic linkage between the two regions.

9. The project was designed to support the government's development strategy for the western regions by providing a link in the vital Changsha–Chongqing corridor, one of the eight prioritized western development corridors included in the Tenth Five-Year Plan (2001–2005) and the Eleventh Five-Year Plan (2006–2010). The project was consistent with ADB's country operational strategy as it supplied a 173 km expressway from Changde to Huaihua in the Changsha–Chongqing corridor. The expressway would shorten the distance between Changde and Huaihua by 45 km and would reduce the journey time by 2–3 hours, thus offering a considerably faster and safer alternative. By lowering transport costs and improving the frequency and level of transport services, the project was expected to spur economic activity and interregional trade, and thereby help reduce poverty in the project area.

### **B. Project Outputs**

#### **1. Expressway**

10. Civil works for the project expressway consisted of (i) 21 subgrade packages and 6 pavement packages procured through international competitive bidding; and (ii) 33 packages for traffic engineering, greening and planting, and buildings and ancillary facilities financed by domestic funds and procured through national competitive bidding. Contracts for the 21 subgrade packages were awarded in August 2005, with construction commencing subsequently. Contracts for the six pavement packages were awarded in August 2007, with construction commencing shortly afterwards. Buildings and ancillary facilities were implemented simultaneously to match the implementation schedule of subgrade and pavement works. All subgrade packages were completed in 2007 and pavement packages in 2008. Traffic engineering and toll collection packages financed by domestic funds were completed in December 2008. Construction of buildings and ancillary facilities—including the project management building, traffic monitoring centers, two service areas, seven toll stations, two maintenance centers, and one tunnel administration station—funded through domestic sources

started in 2007 and was completed in 2008. Planting and greening activities were completed in 2008. The project expressway was opened to traffic on 18 December 2008.

11. At the commencement of project construction, the Changji Expressway Construction and Development Company (CECC) established a high-standard and efficient project management system that was supported by network-based project management software. The software was jointly developed by the CECC and a software company, and it included network-based modules such as documentation, measuring and payment, quality control, changes and variations, monitoring schedule, and online review and approval. Wide application of the software increased the efficiency of project implementation. The implementation period of the project expressway was shortened from 48 months envisaged at appraisal to 40 months. In addition, the CECC achieved the expected technical quality target of meeting 100% of designed technical standards. In September 2007, a quality inspection team from the Ministry of Transport conducted a site inspection of the project and gave a project quality rating of *satisfactory*.

12. The expressway included 5 interchanges, 40 overpasses, 8 flyovers, 433 underpasses, 285 culverts, 74 large and super-large span bridges, 61 medium-span bridges, and 5 small-span bridges. These have all been achieved through the application of sound engineering practices and meeting the prescribed national and international standards. During project implementation, the CECC conducted 18 technical studies in the field, such as slope subgrade construction research on mountain terrain, bridge construction at skewed and slope alignment, innovative reinforced concrete guard rails, application of an intelligent transport system, smart tunnel ventilation and energy saving, tunnel construction techniques, a digitized road management system, tunnel pavement material, restoring planting in weathered areas, and pavement structure research. These studies were closely linked with the relevant project components and their results were widely applied and utilized in the construction. For example, a saving of CNY21 million was achieved after optimizing the design based on the result of slope subgrade construction research on mountain terrain. The outputs of a number of studies were also shared with other project expressways in Hunan province. Among these studies, three were awarded with state patents, three were acknowledged with science achievement recognition credits issued by the Hunan provincial government, and the rest were certified by the Hunan Provincial Transport Department (HPTD).

## **2. Local Roads**

13. The total length of the nine local roads was 517 km envisaged at appraisal and 510 km at completion. Of the 510 km of the local roads improved under the project, 383 km were upgraded to class III or IV between 2004 and 2008, and the remaining 127 km Zhangjiajie–Yuanling highway financed by ADB was improved during 2006–2010. The upgraded roads were of cement or asphalt pavement, with all-weather features meeting national standards and specifications. The improved Zhangjiajie–Yuanling highway shortened travel time from more than 6 hours to 2 hours and resulted in significant improvements to local accessibility. This enabled farm products to be sold for higher prices and increased tourism potential along this corridor. Transport services for townships and villages were improved due to the upgraded road conditions.

## **3. Equipment**

14. There were four equipment packages under the project. Equipment for toll collection, surveillance, and communications was procured in 2007 and supplied in 2008, and was

operational from December 2008. Due to the application of advanced technologies, the total cost of the toll and tunnel systems was higher than the original loan allocation, which was based on the estimate made in 2003. Therefore, domestic funds were made available in addition to the allocated loan proceeds for the equipment category. The equipment for accident management and maintenance funded by domestic sources was procured in 2008 is operational.

#### **4. Consulting Services and Training**

15. An international consulting firm was recruited in August 2005 to provide 49 person-months of consultancy services to the project, mainly on (i) supervision of the civil works; (ii) pavement design; (iii) tunnel construction; (iv) vehicle emissions and environment; (v) operation and maintenance concession; (vi) transport services; (vii) road safety; and (viii) socioeconomic and poverty impact monitoring and evaluation. The international consultants provided cumulative inputs of 41 person-months and worked closely with the HPTD, CECC, and national consultants. The unutilized 8 person-months of international inputs was mainly due to (i) smooth and fast project implementation that resulted in a 1 person-month reduction of the team leader's input; (ii) actual 1 person-month of input for road safety specialist against original 2 person-months; (iii) unutilized 2 person-months for socioeconomic evaluation and monitoring; and (iv) unused 4 person-months on the as-needed basis. The CECC engaged national consultants to provide inputs on socioeconomic evaluation and monitoring through counterpart funds.

16. Construction supervision was the responsibility of a supervision unit of the CECC, headed by a chief engineer. There were six resident supervision offices. Each civil works and pavement package had a domestic resident engineer team comprising technical and administrative staff. Ten national supervision firms were engaged through national competitive bidding to provide supervision services, with cumulative inputs of 6,390 person-months against 5,184 person-months envisaged at appraisal, for subgrade and pavement works, traffic engineering, buildings, landscaping, toll collection, traffic monitoring, and communications. The national consultants provided the requested inputs and performed satisfactorily.

17. HPTD and CECC staff in 14 groups participated in a total of 85 person-months of overseas training on road construction and supervision, bridge and tunnel construction, pavement design and construction, financial management, tunnel operation and management, road maintenance and asset management, traffic engineering and road safety, risk management, human resource development, and expressway concession operation. The overseas training groups submitted training reports to ADB as required, and the staff trainees reported gaining valuable practical knowledge from the overseas training. The knowledge acquired was disseminated within the HPTD and CECC. In addition, the CECC organized on-the-job training courses for 1,040 participants on subjects including construction supervision, quality control, contract management, construction safety, tunnel construction, and pavement design.

#### **C. Project Costs**

18. The total project cost at completion was CNY6.436 billion, almost the same as the cost estimate of CNY6.435 billion at appraisal. The project cost denominated in dollars had increased due to a 21.5% appreciation of the local currency against the dollar, from \$1 = CNY8.27 at appraisal in August 2004 to \$1 = CNY6.49 at completion in May 2011. The actual cost of expressway civil works was about CNY468 million against the estimate of CNY470 million (including contingencies). The cost of equipment increased by CNY16 million, the cost of land acquisition and resettlement increased by CNY23 million, the cost of consulting services

and training decreased by about CNY2 million, and the cost of improvement of local roads decreased by CNY1 million. The originally envisaged contingencies and counterpart funds were sufficient to cover the cost increases.

19. At appraisal, ADB was to provide \$312.5 million from its ordinary capital resources to finance about 40.2% of the total project cost, the Hunan provincial government was to finance \$40.0 million, the Ministry of Transport was to finance \$106.4 million, and a loan from the China Development Bank was to finance \$319.2 million. At project completion, funds for the project included an ADB loan of \$312.29 million, a Ministry of Transport subsidy of \$240.26 million, a Hunan provincial government subsidy of \$111.59 million, and a China Development Bank loan of \$325.59 million. Counterpart funds for the project were provided in a timely manner in accordance with the implementation schedule. Domestic funds were mobilized on time. Appendix 3 presents the project costs and financing plan.

#### **D. Disbursements**

20. Of \$312.50 million in loan proceeds, \$312.29 million was disbursed during 2005–2011. Three types of ADB disbursement procedures were used: reimbursement for civil works, direct payment for consulting services, and commitment procedure for equipment. Disbursement control procedures were satisfactory. Of the disbursed ADB loan proceeds, \$272.70 million financed civil works for the project expressway, \$8.55 million financed equipment, \$1.48 million financed consulting services, \$12.50 million financed local roads, and \$17.06 million covered capitalized interest during construction and commitment charges. One extension of the loan closing date was made from 30 June 2010 to 31 December 2010, and the loan account was closed on 6 May 2011 when loan savings of \$208,000 were canceled. Projected and actual contract awards and disbursements are in Appendix 4.

#### **E. Project Schedule**

21. The project was envisaged to be implemented for about 5 years from March 2005 to December 2009. The local roads component was anticipated to be implemented concurrently with expressway construction. Project expressway construction commenced in September 2005, which was 6 months late because of the extra time taken for civil works procurement. The project readiness, including early approval of preliminary and detailed designs, together with subsequent effective and sound project management, allowed the project expressway to be completed within the scheduled construction period. The project expressway was completed and opened to traffic on 18 December 2008, about 8 months ahead of the contracted construction schedule. Eight local roads were improved in 2009, but improvement of one local road took longer and was completed in 2010. The appraisal and actual project implementation schedule is in Appendix 5.

#### **F. Implementation Arrangements**

22. At appraisal it was envisaged that the HPTD would be the executing agency in charge of overall project implementation and the CECC would be responsible for implementation and operation and maintenance (O&M) of the project expressway. The CECC, a state-owned enterprise with independent legal and financial management capability, obtained a business license in October 2005. The CECC had 11 divisions, two working groups at the project sites, and two resident engineering offices with 111 qualified technical staff. Local roads were implemented by the local highway agencies under the overall guidance of the HPTD. The Zhangjiajie–Yuanling highway was jointly implemented by Huaihua Zhangyuan Highway



Construction Company and Zhangjiajie Zhangyuan Highway Construction Company according to their respective administrative justifications. During operation of the expressway, the CECC, as one of 17 affiliates of the Hunan Provincial Expressway Management Bureau (HPEMB), restructured its organization with eight divisions, three tunnel administration offices, 10 toll stations, four maintenance stations, and two service areas. As of November 2011, the CECC had 538 staff, most of whom were toll collectors and maintenance workers employed from local counties and townships. In addition, about 320 workers were employed from nearby villages and townships to undertake cleaning, greening, landscaping, and routine maintenance for the expressway. Organizational charts are presented in Appendix 6.

## **G. Conditions and Covenants**

23. All covenants were relevant. No covenants were modified or waived during implementation. All loan covenants due were complied with or were being complied with as of December 2011. The financial ratio covenants for the project include (i) a debt–equity ratio of not more than 60:40, (ii) a working ratio of not more than 12% during project expressway operation, and (iii) a debt service coverage ratio of not less than 1.2 during expressway operation from the first year of full operation. The reevaluated financial analysis indicated that the CECC will be able to comply with covenant targets by 2016. Compliance with loan covenants is in Appendix 7.

## **H. Related Technical Assistance**

24. ADB provided project preparatory TA for preparing the Hunan Roads Development II Project.<sup>3</sup> The objective of the TA was to help the government to prepare an integrated roads development project to support pro-poor economic growth and reduce poverty in western Hunan province. The primary focus of the TA was to (i) refine the feasibility study, including the environmental impact assessment (EIA), summary EIA, resettlement plan, and poverty impact analysis for the proposed project, in conformity with ADB's requirements; (ii) broaden the project scope to make it more pro-poor by including a local road component; (iii) confirm the technical, economic, and financial viability of the proposed investments; (iv) review and update the transport and road profiles; and (v) provide the basis for further policy dialogue in such areas as the poverty impact of road projects, vehicle emissions, nongovernment financing, expressway corporatization and commercialization, road safety, and pricing policies for road users. The TA had 13 person-months of international and 20 person-months of national consulting services. The TA commenced in March 2003, was completed in November 2003, and produced the required outcome. Subsequent loan processing was based on the TA findings and recommendations.

## **I. Consultant Recruitment and Procurement**

25. An international consulting firm financed under the loan was recruited on 22 August 2005. The international consultants were fielded on 13 October 2005, and their services ended in October 2008. The national consultants for design, construction supervision, and procurement financed by the government were recruited on a timely basis following the national procedures acceptable to ADB.

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<sup>3</sup> ADB. 2002. *Technical Assistance to the People's Republic of China for Preparing the Hunan Roads Development II Project*. Manila.

26. Civil works for the expressway followed international competitive bidding (ICB) procedures for expressway construction, and national competitive bidding procedures were followed for buildings and ancillary facilities and upgrading of the local roads financed by the borrower. Advance procurement for expressway civil works and international supervision consultants was approved in May 2004 and used effectively. Twenty-one ICB subgrade contracts were awarded in 2005, and six ICB pavement packages were awarded in August 2007. A national procurement agent was engaged by the CECC to assist in handling procurement-related activities. In the bidding documents and contracts, relevant sections of ADB's anticorruption policy were incorporated and complied with. In addition, domestic prevailing practices on anticorruption through a separate integrity and anticorruption contract were widely applied in civil works construction during implementation. Contracts for equipment financed by ADB were procured following ICB procedures. The project contract packages are shown in Appendix 8.

#### **J. Performance of Consultants, Contractors, and Suppliers**

27. The international consultants engaged to assist in project implementation performed satisfactorily and established good working relationships with the HPTD and CECC. The international consultants provided required services in accordance with their respective terms of reference. The national consultants engaged by the CECC provided highly satisfactory services during project implementation.

28. The civil works contractors performed well and completed construction according to the schedule, as stipulated in the contracts, with satisfactory quality. The domestic design institute designed the expressway in line with international best practices. The civil works of the expressway, comprising bridges and pavement, were well implemented and of satisfactory quality. The equipment for O&M was supplied, installed, and commissioned according to the schedule. The environmental monitoring during construction was satisfactorily conducted by the national consultants. The overall performance of the contractors and suppliers was assessed as *highly satisfactory*.

#### **K. Performance of the Borrower and the Executing Agency**

29. The HPTD implemented the project effectively and efficiently. The project management during the preparation and construction phases was rated *highly efficient* and *effective*. Despite certain delays in the construction commencement, the project expressway was completed ahead of the original schedule by adopting sound engineering and technical measures. The expressway construction and maintenance met international standards. The CECC had sufficient capacity to manage large-scale works contracts. An advanced project management system was put in place to ensure the effective use of funds. The domestic funds were mobilized on time. Withdrawal applications were submitted in a timely manner, and contractors were paid on time. The required land acquisition and resettlement were completed on time to the satisfaction of the affected people. The performance of the borrower, HPTD, and CECC was assessed as *highly satisfactory*.

#### **L. Performance of the Asian Development Bank**

30. ADB conducted regular loan review missions during project implementation and provided effective advice to the HPTD and CECC on project implementation, monitoring, and procurement matters. ADB reviewed and processed procurement documents efficiently. ADB responded efficiently and promptly to all requests of the borrower, HPTD, and CECC.

Withdrawal applications were processed and disbursed on time. The HPTD and CECC expressed satisfaction with the delegation of project administration to the ADB resident mission in PRC, which ensured closer and more efficient communications. ADB's performance during project implementation was assessed as *highly satisfactory*.

### III. EVALUATION OF PERFORMANCE

#### A. Relevance

31. The project was assessed as *highly relevant*. The project is located in the western part of Hunan province and serves as the area's main trunk transport corridor, connecting provincial capital Changsha with Chongqing and other economic centers in the western provinces. It was the government's top priority project in its western development strategy. The goal of the project was to increase economic growth and thus reduce poverty in Hunan province by (i) enhancing economic efficiency, fostering trade, facilitating interregional integration, and improving traffic safety; (ii) providing a link in the Changsha–Chongqing western development corridor; (iii) spreading economic and social benefits over a wider cross-section of local communities by improving accessibility for the rural poor in the corridor; and (iv) helping improve people's incomes and well-being. These objectives were achieved through (i) VOC savings of 13.4% for freight and safer transport conditions with less traffic accidents in terms of million vehicles per km; (ii) a shorter road link between Changsha and Chongqing, which has shortened the route between Changde and the border between Yuanling and Louxi by 45 km, and (iii) the improvement of 510 km of local roads. This enabled more benefit sharing, which resulted in a reduction in poverty incidence from 10.2% to 7.5% in Changde and an increase in rural per capita income from CNY6,380 to CNY16,385 in Yuanling from 2004 to 2010. The project is in line with ADB's past and present country strategy and program for the PRC road sector. The project contributed to expanding the expressway network in Hunan province from 1,403 km in 2005 to 2,649 km in 2011, and to connecting villages and counties in the province with all-weather roads.

#### B. Effectiveness in Achieving Outcome

32. The project was rated *effective* because it (i) enhanced economic development and poverty reduction in the project area, (ii) increased transport efficiency, (iii) provided farmers with better access to markets and social services, and (iv) improved road safety in the transport corridor. Hunan's GDP grew 13.2% in 2009, 12.9% in 2010, and 12.8% in 2011. Poverty incidence in Changde was reduced from 10.2% in 2006 to 7.5% in 2010, and in Huaihua it was reduced from 12.2% in 2006 to 9.0% in 2010. The expressway carried 47% of total corridor traffic in 2010 because of better transport conditions and the shorter distance. During 2008–2010, passenger transport grew by 20.9% and freight transport grew by 41.9%. Traffic congestion along the national highway 319 (G319) between Changde and Huaihua was significantly reduced. In 2011, the weighted average VOC for buses was CNY134.9 per 100 km for the expressway and CNY146.2 per 100 km for the existing road; for trucks the VOC was CNY128.9 per 100 km for the expressway and CNY146.2 per 100 km for the existing road. Total foreign trade increased from \$6.0 billion in 2005 to \$10.2 billion in 2009 and to \$14.7 billion in 2011. Travel time on the improved Zhangjiajie–Yuanling highway has been reduced from 6 hours to 2 hours. Regular bus services were provided for remote villages and townships after improvement of the local roads. Within 24 months of operation of the expressway, there were 58 traffic accidents on the project expressway that caused 35 injuries, which was lower than the 85 accidents and 70 injuries that occurred on the parallel G319. The expressway is safer, with 16.6 accidents per 100 million vehicle km compared with 22.7 accidents per 100 million vehicle km.

on the parallel G319. Without the expressway, the G319 would have been more congested and would have had lower speeds and higher vehicle emissions. To ensure that vehicle emissions are within the limit set by the government, vehicles in Hunan province are checked annually through a national emissions certificate system.

33. The CECC was established as a state-owned enterprise under the Company Law of the PRC. Obtaining its business license in October 2005, The CECC thus maintains its financial and management autonomy. This autonomy ensured strong accountability and allowed CECC management to implement the expressway project efficiently and manage the expressway effectively. The CECC has gained international-standard capacity in project management through implementing the expressway. The capacity building through both domestic and international training helped the CECC implement the expressway in accordance with the highest technical standards and prevailing international practices. The CECC also conducted 18 project-oriented technical studies during implementation, which achieved both technical accomplishments as well as economic benefits through their application in the construction. After completion of the expressway, the HPTD assigned key management and technical professionals of the CECC to other challenging expressway projects in Hunan province, demonstrating that the strengthening of institutional capacity throughout project implementation has benefited the sector and is being shared and disseminated with other road projects.

### **C. Efficiency in Achieving Outcome and Outputs**

34. Economic and financial reevaluation rated the project *less efficient*. The road network in Hunan province has been improved significantly since 2006. The total transport sector investment for 2006–2010 was CNY243.1 billion, three times the total investment for 2001–2005. It also accounted for about 8.1% of the total fixed asset investment in Hunan during 2006–2010. Through such unprecedented massive investment in the road sector, the provincial road network had a total length of 227,998 km at the end of 2010, of which 139,798 km was completed between 2006 and 2010. The road density was more than doubled, from 41.6 km per 100 square km (km<sup>2</sup>) in 2005 to 105.8 per 100 km<sup>2</sup> in 2010. The total rural road length was 185,822 km, comprising 29,356 km of county roads, 55,741 km of township roads, and 100,725 km of village roads. All townships and administrative villages in the project area now have road access. All-weather roads with either cement or asphalt pavement were connected to 99.8% of towns and 81.5% of administrative villages. Regular bus services were provided for all townships and 85.9% of administrative villages in 2010.

36. The reevaluated economic internal rate of return (EIRR) for the expressway is 11.3%, down from the 18.6% estimated at appraisal for the expressway and local roads. The lower EIRR mainly reflected the lower actual traffic than projected at appraisal on the expressway, higher unit construction costs than those of other completed expressways in Hunan province, and higher O&M and repaving costs. As the reevaluated EIRR is lower than the cut-off rate of 12.0%, the project's economic viability needs further assessment. Sensitivity analysis was carried out to test the impacts of (i) an increase in O&M costs, (ii) a decrease in benefits, and (iii) both combined. The analysis indicated that the project may be marginally economically viable under these scenarios. The EIRR was more sensitive to changes in benefits than to changes in O&M costs. The EIRR would be 10.3% if benefits decreased by 10%. In the worst-case scenario of a 20% increase in O&M costs and a 10% benefit reduction, the EIRR falls to 9.1%, lower than the 12.0% cut-off rate. The economic reevaluation is in Appendix 9.

37. The financial internal rate of return (FIRR) was recalculated at 6.0%, which is lower than the appraisal estimate of 7.6%. This is attributed to three factors: (i) traffic in early years was far

below appraisal estimates because the connecting expressways were not yet completed, (ii) actual toll rates were much lower than appraisal estimates, and (iii) O&M and repaving costs were higher than those assumed at appraisal. The after-tax weighted average cost of capital (WACC) in real terms calculated at 3.7% when tested, based on the actual financing mix of various sources. As the project's recalculated FIRR is higher than the revised WACC, the project is financially viable. Sensitivity analysis to test the impacts of variation in O&M costs and revenues indicates that the project remains financially viable even when revenue is 20% less than the forecast and the O&M cost is 20% higher than projected. The financial reevaluation is in Appendix 10.

#### **D. Preliminary Assessment of Sustainability**

38. The project was assessed *likely sustainable*. The completion of the project expressway and local roads removed a bottleneck between Changsha and Chongqing, relieved traffic congestion in the project area, and improved the efficiency of road transport services in the corridor and the project area. It provided convenient and safer direct road access to poorer remote villages in the project area. Since the opening of the project expressway, a significant amount of traffic has been diverted from the G319. The expressway and improved local road network have contributed to higher GDP growth in Changde and Huaihua and poverty reduction through robust economic growth and an integrated road network. Continued economic growth in the project area, assisted by the soon-to-be-completed remaining expressway section from Jishou to Chadong, will ensure a steady income from toll revenues for the CECC to manage the expressway, bringing positive economic and social development to the project area.

39. The physical sustainability of the expressway should be ensured by the use of sound engineering technology in its construction, which met prevailing international standards, and by the well-developed technical capacity of both the HPTD and CECC. The project expressway passed through some geotechnically difficult and complex terrain. To cope with various technical difficulties and challenges, the CECC initiated 18 technical studies associated with construction of the project expressway. Out of the 18 studies, three were awarded state patents and three were acknowledged as advanced technology achievements at the provincial and ministry level. The application of these technical research products in the project expressway's construction generated significant social and economic benefits. The CECC was expected to continue practicing good management and sound financial administration in the future.

40. The HPTD and local governments were committed to developing and maintaining the local roads and rural road networks. In October 2005, the state council issued a new rural roads administration policy that aims to improve institutional arrangements, budgeting, and local government capacity for road improvement and management. The HPTD responded to the government's call with proactive measures. From 2006 to 2010, the HPTD committed CNY41.7 billion to the local road network improvement and CNY40.5 billion to upgrade of rural roads. The priority and commitment given to local and rural roads with steady budget support and multilevel inputs has ensured sustainable development of local and rural roads, which in turn has improved both the accessibility and connectivity of the remote and poor areas.

#### **E. Impact**

41. Hunan province has experienced robust economic development, with GDP growth of 9.0% in 2000 rising to 13.2% in 2011. After the opening of the project expressway, GDP growth rates in the project influence areas reached 15.2% in Changde in 2010 (from 11.8% in 2005) and 14.8% in Huaihua (from 11.6% in 2005). The higher growth rate in the project influence

area confirmed the project's economic impact in spurring fixed-asset investments and attracting service and secondary industries. In 2010, the total external investments utilized by Changde were CNY25.3 billion and by Huaihua CN19.6 billion, with an import value of \$257 million and an export value of \$47 million. Accelerated economic development and rapid transformation of the industrial structure in the project influence areas improved the living standards of local residents and directly contributed to poverty reduction. In 2010, the annual per capita income of Changde was CNY26,551 and grew by 16.1%, and annual per capita income in Huaihua was CNY14,371 and grew by 16.4%.

42. Land acquisition and resettlement for the expressway commenced at the end of 2003 and was mostly completed in 2004. A total of 19,613  $mu^4$  of land was permanently acquired for the expressway, 3.1% less than the estimate in the resettlement plan. A total of 418,746 square meters ( $m^2$ ) of buildings were demolished, 78% more than estimated in the resettlement plan. A total of 47,417 people were affected by land acquisition and 8,280 people were affected by house demolition. The major reason for the significant increase in house demolition was that some houses located close to the expressway alignment could be affected by landslides and were relocated, as requested by the potentially affected people. The increased number of people affected by land acquisition was mainly due to the readjustment of farmlands in most of the affected villages in Dingcheng district after land acquisition. The implemented compensation rates for house demolition were in accordance with the replacement costs in the updated resettlement plan. The actual land acquisition and resettlement cost was CNY403.69 million, 2% higher than the CNY395.80 million in the updated resettlement plan. The land acquisition and resettlement impacts of the local road component (Zhangjiajie–Yuanling class II highway) were unknown at the time of appraisal. A separate resettlement plan was prepared and approved by ADB in 2007, as per loan covenant. During implementation, 1,310  $mu$  of land was permanently acquired for the Zhangjiajie section and 55,362  $m^2$  of buildings were demolished with 261 households affected. A total of 689  $mu$  of land was permanently acquired for the Yuanling section and 52,122  $m^2$  of buildings were demolished with 427 households affected. The evaluation of land acquisition and resettlement is in Appendix 11.

43. Hunan University was engaged for external monitoring and evaluation (M&E) of land acquisition and resettlement implementation. A baseline survey of 480 sample households was conducted in early 2004, and the income changes of those sample households was tracked in three consecutive years—2006, 2007, and 2008. The local government, CECC, and affected communities took various measures to help affected households restore their incomes through (i) adjusting and reclaiming farmlands; (ii) improving irrigation systems; (iii) planting fruit trees and other cash crops, and rearing livestock; (iv) providing technical training and job opportunities as migrant laborers; and (v) recruiting affected people as toll collectors. According to the external resettlement monitoring and evaluation report, the average per capita net income of sample affected households increased from CNY1,528 in 2003 to CNY4,034 in 2008. The external monitoring and evaluation report confirmed that restoring the incomes of affected people had been achieved.

44. Construction of the expressway commenced in 2005, and it was opened to traffic in December 2008. A total of CNY6.43 billion was invested in expressway construction, and it generated income, employment, and business opportunities, as well as potential advantage for attracting external investment, contributed significantly to regional socioeconomic growth in the project area, and in Hunan province as a whole. The statistics show that the per capita GDP of three districts increased remarkably from 2004 to 2010: 176% in Dingcheng district, 134% in

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<sup>4</sup> A  $mu$  is a Chinese unit of measurement (1  $mu$  = 666.67  $m^2$ ).

Taoyuan county, and 157% in Yuanling county. In contrast, poverty incidence decreased significantly in the project area from 2004 to 2010: from 11.5% to 5.6% in Dingcheng district, from 11.6% to 6.5% in Taoyuan county, and from 21.6% to 15.3% in Yuanling county.

45. The expressway construction directly employed 4,643 local laborers along the alignment. The locally procured construction materials and supplies—including 111,000 tons of steel, 940,000 tons of cement, 23,000 cubic meters (m<sup>3</sup>) of timber, 14.8 million m<sup>3</sup> of sand and stone, and 220,000 tons of gasoline and diesel fuel—also created huge employment opportunities in the project area. A total of 6,150 local laborers worked for the expressway construction, 44 people were recruited to work for the toll services, and 320 local people were hired for cleaning and maintenance. Most of these people were from poor families in surrounding areas.

46. The project is located in ethnic minority areas, particularly in Yuanling county, which has 367,400 minority people (56.5% of the total county population) including Miao, Tujia, Bai, and other 24 minority groups. During project preparation, an ethnic minority development plan was formulated to ensure that the project mitigated adverse project impacts on minorities and benefited local communities and people in a culturally penetrate manner. Hunan University was recruited as the external monitoring agency to monitor the implementation of the ethnic minority development plan as well as the social action plan. The latest development in the socioeconomic and ethnic minority area is in Appendix 12.

47. The project significantly spurred regional social development and poverty reduction in the project area, as evidenced by (i) a significant increase in per capita GDP and farmers' incomes; (ii) a significant decrease in poverty incidence; (iii) increased employment and income for the poor during construction and operation; (iv) improved road conditions enabling local women, particularly those living in remote areas to access better medical services; and (vi) the opening of many clinics in rural areas. In addition, after the opening of the expressway from Jishou to Chadong, the project expressway will further contribute to socioeconomic development and poverty reduction in the project area, as well as in the interprovincial region covering Hunan and Chongqing.<sup>5</sup> With 1.9 million project beneficiaries, the project's social economic development and poverty reduction impacts were significantly positive.

48. The project environmental management plan (EMP) and the monitoring program were implemented effectively. The HPTD established an environmental management office to coordinate environmental management for the project. The environment and resettlement office under the CECC oversaw the EMP implementation. Supervision and inspection of onsite mitigation measures were conducted by the supervision institutions setup in the CECC. During construction, the highway planning and design institute was engaged to periodically monitor the project construction impacts on water, air, noise, and ecological environment. The Huaihua Municipal Environment Monitoring Station monitored the environmental impacts of the rural roads development component. The Hunan Provincial Soil and Water Conservation Monitoring Station monitored soil erosion and conservation, and prepared 11 monitoring reports. In total, 17 environment monitoring activities were carried out, based on which four environment monitoring reports were submitted to ADB, two of which were listed on the ADB website.

49. According to the environment completion technical review report prepared by the HPTD, the adverse environmental impacts were mitigated adequately following the project EMP and there was no significant environmental damage during construction. During operation,

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<sup>5</sup> ADB. 2005. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for the Hunan Roads Development III Project*. Manila.

environmental management involves mainly the maintenance of slope protection works and landscape vegetation, wastewater and solid-waste collection and treatment from service areas, and their monitoring. These tasks are being coordinated by the environment and resettlement office under the CECC and supervised by the environmental management office of the HPTD. The environmental impact analysis is in Appendix 13.

#### **IV. OVERALL ASSESSMENT AND RECOMMENDATIONS**

##### **A. Overall Assessment**

50. The project was rated *successful*. The project was evaluated (i) highly relevant to the government's and ADB's development strategies, (ii) effective in achieving outcomes, (iii) less efficient in achieving outcomes and outputs, and (iv) likely to be sustainable. The project was successfully implemented and achieved its main objectives of accelerating economic development and thereby reducing poverty in Hunan province through significant road improvements in the project area. The project has (i) enhanced economic efficiency, fostered trade, facilitated interregional integration, and improved traffic safety; (ii) provided a link in the Changsha–Chongqing western development corridor; (iii) spread economic and social benefits over a wider cross-section of local communities by improving accessibility for the rural poor in the corridor; and (iv) helped improve people's incomes and well-being. Project implementation was carried out in an effective and efficient manner. The project expressway was completed ahead of the project completion date envisaged at appraisal. The quality at completion of the project expressway and improved local roads was satisfactory. The improved local roads benefited the rural and poor areas, and rural transport services were extended to the remote and poor areas after the road improvement. Institutional capacity was strengthened through the human resource development plan. Knowledge was gained and capable staff resources were shared among other ongoing expressway projects.

51. The expressway traffic volume was significantly lower than the appraisal forecast. Although it was forecast that the interprovincial through-traffic might be higher when the section under the Hunan Roads Development III Project (footnote 5) linking the project expressway with Chongqing and the western provinces is completed in 2012, it is still likely that the traffic volume in coming years will be lower than the projected traffic at appraisal. Significant improvement in the road conditions and transport capacity of this transport corridor will lead to economic development in Hunan and Chongqing and the western regions and increased traffic volumes. For the time being, it is acknowledged that toll revenue from the expressway due to low traffic volume has decreased to a marginal level, resulting in a lower FIRR and EIRR for the project. The reevaluated FIRR of 6.0% and EIRR of 11.3% imply that financial and economic viability of the project need to be further strengthened through the stronger government support.

##### **B. Lessons**

52. The project expressway was implemented in an efficient and effective manner and was opened to traffic on 18 December 2008, which coincided with the completion date estimated at appraisal. The timely completion of the project was mainly due to early project preparation and readiness, including the completion of preliminary design in March 2003 and the detailed design in December 2003, as well as advance procurement of key civil work contracts and project implementation consultants. The achievement of key milestones of the project contributed to timely completion of the project expressway, despite some delays at the commencement stage.



53. Based on the actual traffic recorded in 2009 and 2010, the traffic forecast at appraisal was unrealistically high for both the project expressway and parallel G319. The lower traffic and increased project cost have negatively impacted on the project financial reevaluation compared to appraisal. It is, therefore, suggested that a road traffic origin–destination survey be conducted in an appropriate manner, including timing and locations for survey, detailed information on the local and through traffic, accurate information on vehicle categories, and validation of traffic results.

54. The project encountered common resettlement issues, and timely measures were taken: (i) early completion of the major land acquisition resettlement activities 1 year prior to the commencement of civil works allowed adequate time for resettlement implementation as well as completion of civil works; (ii) instead of concentrated resettlement sites, allocation of individual housing plots ensured that the affected households moved into new houses in a timely manner, but this approach has to be prudently decided upon based on the local context; (iii) a good relationship was built with the local communities through appropriate assistance in the improvement of local community facilities such as schools and access roads; and (iv) adverse impacts caused by construction activities should be identified during the project design stage.

## **C. Recommendations**

### **1. Project Related**

55. Although traffic accidents on the project expressway were lower in 2009 and 2010 compared with traffic accidents recorded on the existing highway, it is necessary to continue improving road safety by taking all applicable engineering and management measures as well as educating drivers and local people. The CECC should, in cooperation with the government agencies concerned, continue to maintain high safety standards and performance for the expressway and be ready to deal with various safety issues.

56. The project performance evaluation report can be prepared in 2013 or later, as the project will have been fully operational for more than 5 years and the transport corridor between Changsha and Chongqing will have been completed for more than 2 years and the traffic, maintenance, physical condition, attainment of benefits, and impact on poverty reduction can be more comprehensively assessed.

### **2. General**

57. The project expressway is part of the western development corridor between Changsha and Chongqing. The economic benefits and regional economic integration along the corridor are gradually being built. For a project that is part of a main transport corridor, it is necessary to more realistically forecast the traffic volume, as the economic and regional integration benefits that will be derived from the transport corridor will only be fully realized over a much longer period of time. The PRC authorities should assess corridor connectivity and capacity, make realistic traffic forecasts, and prioritize the road section with respect to sound technical feasibility and financial viability.

## PROJECT FRAMEWORK

Design Summary	Performance Indicators/Targets		Monitoring Mechanisms	Assumptions and Risks
	At Appraisal	At Completion		
Goal				
Economic development and poverty reduction	10% increase in GDP over 3 years	Hunan achieved GDP growth of 13.2% in 2009, 12.9% in 2010, and 12.8% in 2011.	Hunan Statistics Yearbook	
	10% decrease in poverty incidence in the project area over 5 years	Poverty incidence of Changde decreased from 10.2% in 2006 to 9.6% in 2007, 9.1% in 2008, 8.6% in 2009, and 7.5% in 2010.  Poverty incidence of Huaihua decreased from 12.2% in 2006 to 11.3% in 2007, 10.5% in 2008, 9.6% in 2009, and 9.0% in 2010.	Socioeconomic and livelihood surveys by the executing agency  ADB missions to assess project implementation	
	Generated employment in the nonfarm sector that is 10% higher than in the control area in 5 years	From 2006 to 2010, nonfarm sector employment in Changde increased from 27% to 38%, and in Huaihua increased from 23% to 34%.		
	10% growth in the number of rural enterprises within 3 years	From 2004 to 2008, private enterprises in Changde increased from 174,000 to 267,000 (53% growth), and in Huaihua from 139,000 to 153,000 (10% growth).		
	10% increase in inter- and intraprovincial trade in the western regions within 3 years	Total consumer retail sales in Hunan were CNY491.4 billion in 2009 (16.4% growth), CNY584.0 billion in 2010 (18.8% growth), and CNY680.9 billion in 2011 (16.6% growth).		
Purpose				
Increase transport efficiency	10% decrease in congestion along G319 between Changde and Huaihua within 3 years  10% reduction in VOCs or transport fares within 3 years  10% improvement in input output prices within 3 years  Annual 10% increase in interprovincial traffic-passengers and tonnage within 3	In 2009, the expressway carried 47% of the corridor traffic because of better transport conditions and shorter distance; traffic congestion along G319 was significantly reduced.  In 2011, the weighted average VOCs for buses were CNY134.9 per 100 km for the expressway and CNY146.2 per 100 km for existing road, and for trucks CNY128.9 per 100 km for the expressway and CNY146.2 per 100 km for existing road.  Total import and export was increased from \$6.0 billion in 2005 to \$10.2 billion in 2009 and to \$14.7 billion in 2011.	Project completion report  Traffic counts survey by the executing agency along the corridor  Annual reports of transport enterprises in Hunan  Direct measures of cost and travel time by the consultants	Assumptions  Continued rapid economic growth in the PRC and Hunan province  The reduction in VOCs is passed on to consumers

Design Summary	Performance Indicators/Targets		Monitoring Mechanisms	Assumptions and Risks
	At Appraisal	At Completion		
	years	From 2008 to 2010, passenger transport grew 20.9% and freight grew 41.9%.		
Provide rural farmers with better access to markets and social services	10% reduction in travel time to nearest markets, health services, and schools within 3 years  Traffic from villages to townships and counties that is 10% higher than in the control area	Improved Zhangjiajie–Yuanling highway has reduced travel time from 6 hours to 2 hours.  Regular bus services were provided after improvement of the local roads.	Direct measurement of cost and time for small trucks along the corridor, as well as socioeconomic surveys by the consultants	The executing agency implements the local road improvement program as planned
Improve road safety in the transport corridor	25% decrease in accident rate on the project roads during the first 5 years of operation	In 2010, traffic accident rate on the project expressway was 16.6 accidents per 100 million vehicle km compared with 22.7 accidents per 100 million vehicle km on the parallel existing road.	Accident statistics provided by the Hunan Public Security Bureau	Better traffic enforcement and accident reporting procedures are in place
<b>Outputs</b>				
<b>Civil Works and Equipment</b> 173 km of expressway, 11 km of class II connector roads, 81 bridges including 3 extra-large bridges, and 7 interchanges	Construction completed and open to traffic by 2008	The project expressway was completed and opened to traffic on 18 December 2008.	Project administration missions, progress reports, and PCR	<b>Assumptions</b> Implementation capacity of the executing agency  Good performance of contractors  Strict construction supervision and quality control
Upgrading of 517 km of local roads	Works carried out and completed concurrently with expressway works, using government design and standards acceptable to ADB	510 km of local roads were improved.  The upgraded roads were of cement or gravel asphalt pavement, with all-weather surfaces meeting domestic standards and specifications.	Project administration missions, progress reports, international consultant reports, and PCR  Construction supervision by national consultants	Local government will be able to mobilize adequate resources to implement the program
Procurement and installation of equipment for traffic engineering, road safety, traffic	Equipment package contents, procurement schedule, and actual equipment cost	Four equipment packages including toll collection, surveillance, and communications were procured and supplied in 2007 and 2008,	Progress report, project review missions, and PCR	Completion of equipment procurement and installation at project

Design Summary	Performance Indicators/Targets		Monitoring Mechanisms	Assumptions and Risks
	At Appraisal	At Completion		
monitoring, road maintenance, and tunnel operation		and are now operational.		opening
High-quality construction supervision and monitoring and evaluation; capacity building for CECC	Achievements in terms of quality control and timely implementation  Improved CECC implementation capacity and expressway operation	The project expressway was implemented efficiently and effectively with high quality, and a quality inspection team from the Ministry of Transport conducted a site inspection in 2007 with a <i>satisfactory</i> rating of the project.  CECC has conducted 18 technical studies during construction, of which six studies were awarded with national or provincial certificates.	Progress reports, project administration and completion review missions, training assessment	Timely selection of experienced and qualified consultants
Adequate resettlement and rehabilitation of all affected people and households (about 37,000 people affected)	Implementation of resettlement plan  Compensation levels for permanent loss of farmland, housing, and other assets as agreed  Welfare of those resettled at least to level prevailing before land acquisition	The implemented compensation rates for house demolition were in accordance with the replacement costs in the updated resettlement plan.  According to the external resettlement monitoring and evaluation report, the average per capita net income of sample affected households increased from CNY1,528 in 2003 to CNY4,034 in 2008. The external monitoring and evaluation report confirmed that restoring the incomes of affected people has been achieved.	Progress reports, review missions  Baseline household survey  Independent consultants to monitor entitlements, prepare periodic report during resettlement implementation, and evaluate achievement of objectives upon completion of resettlement plan and 1 year after	Land acquisition and resettlement plan implemented as agreed  Affected population compensated at agreed rates  Off-farm income opportunities increase
O&M concession awarded to the private sector	O&M concession framework and time-specific schedule of the concession award  Enhanced transparency in the bidding process	Draft O&M concession framework was submitted to ADB in 2007.  HPTD plans to implement the O&M concession when the related legal framework is ready.	O&M concession framework and bidding document, review missions	Capacity and capability of the provincial government and executing agency to undertake private sector transactions  Enough private investors are interested in bidding.
Enhanced provision of transport services	Implementation of the measures to adequately increase	Extensive bus transport services were provided for both expressway and improved local	Progress reports, review missions	Adequate coordination among various

Design Summary	Performance Indicators/Targets		Monitoring Mechanisms	Assumptions and Risks
	At Appraisal	At Completion		
	transport services	roads.		government offices
<b>Activities/Inputs</b>				
Provision of adequate counterpart funds	Funds (\$156 million) allocated from the Ministry of Communications and HCD; domestic commercial bank loan (\$319.2 million)	Domestic funds were mobilized on time, including a Ministry of Transport subsidy of \$240.26 million, a Hunan provincial government subsidy of \$111.59 million, and a loan from China Development Bank of \$325.59 million.	Project budget by financing sources	<b>Assumptions</b> Timely provision of adequate counterpart funds
Recruitment of supervision consultant including 49 person-months of international and 5,184 person-months of national consulting services for construction supervision, 24 person-months of national consultants for monitoring and evaluation, about 65 person-months of international training	Consultants to be recruited by March 2005  Actual international and national consultants' inputs  Development and implementation of the training program	An international consulting firm was recruited in August 2005.  Actual international consultant inputs were 41 person-months and national consultant inputs were 6,390 person-months.  A total of 14 groups participated in 85 person-months of international training. A cumulative number of participants attending on-the-job training courses was 1,040.	Contract documents	
Award of contracts	Civil works contracts to be awarded by March 2005	Civil works contracts were awarded in August 2005.	Contract documents	Effective project management activates coordination and planning
Expressway construction and upgrading of selected local roads	Expressway construction including testing and commissioning, and upgrading, completed by 2008	Expressway was completed and opened to traffic on 18 December 2008. Out of nine local roads totaling 510 km, eight were improved during 2004 and 2008 and one was improved during 2006 and 2010.	Progress reports, project administration mission, PCR	Effective project and contract management, timely implementation of remedial actions required by unexpected situations, effective performance of contractors
Construction supervision training program	Implementation of supervision activities; development and implementation of contract management system and quality control procedures	Project implementation was conducted in an effective and efficient manner. CECC has developed a project management system which was supported by a network-based project management software since construction commencement.	Progress reports and review missions, training program and list of candidates, post-training reports and evaluation	Qualified and experienced consultants Effective transfer of knowledge from the trainees to CECC
Funding and staff	\$53 million and	\$62 million was disbursed for	Project review	

Design Summary	Performance Indicators/Targets		Monitoring Mechanisms	Assumptions and Risks
	At Appraisal	At Completion		
resources for land acquisition and resettlement  Implementation of compensation measures	compensation measures implemented	land acquisition and resettlement, and compensation measures were implemented according to resettlement plan.	and administration missions, executing agency and consultant reports, resettlement monitoring program, detailed action plan	
Implementation of measures in EMDP.	Actions in EMDP implemented during project implementation	Subsequent EMDP was prepared in 2004, local government of Dingcheng, Taoyuan, and Yuanling cooperated with Hunan provincial expressway administration bureau and provided agriculture training; special assistance program to enable minorities benefited from the project.	Project review missions  Progress reports by the executing agency  EMDP monitoring program  Detailed action plan	Good monitoring and review takes place
Implementation of environmental impact mitigation measures in project design and construction	Mitigation measures and environmental enhancement measures form the environmental impact assessment and environmental management plan	The project permanently acquired 1,307.5 hectares, and employed 18 borrow pits and 59 disposal sites. All borrow pits and spoil sites have been restored and rehabilitated according to the SEPP through retaining structures, drainage systems, and vegetative measures. Six concrete mixing stations have been rehabilitated and revegetated effectively. During operation, the solid wastes are mainly from domestic operations of toll and service stations. All stations have been fitted with garbage collection facilities. All solid wastes are collected and transported according to national and local regulations.	Environmental monitoring reports by executing agency and provincial environmental protection bureau	Timely provision of funds and provision of additional funds if required
Monitoring and evaluation of benefits from the road development.	Development and implementation of PPMS	The PPMS was established in 2004 and baseline data was collected in 2004.  The PPMS was updated at project completion in 2008 and 3 years thereafter.	PPMS consultant reports; progress reports; provincial and county statistics; midterm, completion, and post-evaluation missions	Timely recruitment of national consultants for following up and monitoring socioeconomic impacts, effective consultation,

Design Summary	Performance Indicators/Targets		Monitoring Mechanisms	Assumptions and Risks
	At Appraisal	At Completion		
				and coordination among the agencies involved

ADB = Asian Development Bank, CECC = Changji Expressway Construction and Development Company, EMDP = ethnic minorities development plan, G319 = national highway 319, GDP = gross domestic product, ha = hectare, HPTD = Hunan Provincial Transportation Department, km = kilometer, O&M = operation and maintenance, PCR = project completion report, PPMS = project performance management system, PRC = People's Republic of China, SEPP = soil erosion protection plan, VOC = vehicle operating cost.

Sources: Asian Development Bank and Hunan Provincial Transportation Department.

**CHRONOLOGY OF MAJOR EVENTS**

<b>Date</b>	<b>Events</b>
23 September 2002	Project preparatory technical assistance approval
20 March 2003	Preliminary design of the project expressway completed
26 December 2003	Detailed design of the project expressway completed
5–13 November 2003	Fact-finding mission fielded
11 December 2003	Environment assessment impact was approved by the State Environment Protection Bureau
4 May 2004	Management review meeting held
8–14 May 2004	Appraisal mission fielded
26 May 2004	Prequalification document approved
17 June 2004	Staff review committee meeting held
9–13 August 2004	Loan negotiations held
19 August 2004	Board circulation
9 September 2004	Loan approval
14 December 2004	Bid opening for expressway civil works
26 May 2005	Loan agreement signing
7 July 2005	Bid evaluation for expressway civil works contract approved
16 August 2005	Loan effectiveness
22 August 2005	Consulting services contract approved
1 September 2005	Commencement of civil works construction
1 September 2005	First disbursement
2–4 December 2005	Inception mission fielded
22 March 2006	Prequalification document for pavement packages approved
16–20 May 2006	Loan review mission fielded
5 June 2006	Transfer of project administration to resident mission in the People's Republic of China
5 January 2007	Bid opening for pavement packages
23 July 2007	Bidding document for equipment approved
1 August 2007	First loan reallocation approved
20 August 2007	Bid evaluation for pavement packages approved
10–14 September 2007	Loan review mission fielded
18 April 2008	Bid evaluation for equipment approved
23–29 April 2008	Midterm review mission fielded
18 December 2008	Project expressway was opened to traffic
11–15 May 2009	Loan review mission fielded
10 March 2010	First repayment of loan principal
29 June–2 July 2010	Loan review mission fielded
30 June 2010	Original loan closing date
5 November 2010	Extension of loan closing date from 30 June 2010 to 31 December 2010
6 December 2010	Final disbursement
6 May 2011	Final reallocation, loan balance cancellation, and actual loan closing date
21–25 November 2011	Project completion review mission fielded

Sources: Asian Development Bank, Hunan Provincial Transportation Department, and Changji Expressway Construction and Development Company.



## PROJECT COSTS AND FINANCING PLAN

**Table A3.1: Project Costs**  
(\$ million)

Item	At Appraisal			At Completion		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
<b>A. Base Cost</b>						
1. Expressway civil works	256.76	239.54	496.30	272.68	448.34	721.02
2. Equipment	8.81	0.00	8.81	8.55	5.18	13.73
3. Land acquisition and resettlement	0.00	46.00	46.00	0.00	62.19	62.19
4. Consulting services and training	1.69	34.13	35.82	1.50	43.82	45.32
5. Local roads	12.50	69.36	81.86	12.50	91.56	104.06
<b>Subtotal (A)</b>	<b>279.76</b>	<b>389.03</b>	<b>668.79</b>	<b>295.23</b>	<b>651.09</b>	<b>946.32</b>
<b>B. Contingencies</b>						
1. Physical contingencies	19.47	23.34	42.81	0.00	0.00	0.00
2. Price Contingencies	5.37	23.91	29.28	0.00	0.00	0.00
<b>C. Subtotal (B)</b>	<b>24.84</b>	<b>47.26</b>	<b>72.09</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>D. Interest during Construction and Commitment Charge</b>	<b>9.56</b>	<b>27.65</b>	<b>37.21</b>	<b>17.06</b>	<b>26.34</b>	<b>43.40</b>
<b>Total (A+B+C+D)</b>	<b>314.17</b>	<b>463.93</b>	<b>778.10</b>	<b>312.29</b>	<b>677.43</b>	<b>989.72</b>

Note: Numbers at appraisal do not sum precisely because of rounding.

Sources: Asian Development Bank, Hunan Provincial Transportation Department, and Changji Expressway Construction and Development Company.

**Table A3.2: Financing Plan**  
(\$ million)

Source	At Appraisal			At Completion		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
Asian Development Bank	312.50	0.00	312.50	312.29	0.00	312.29
Ministry of Communications <sup>a</sup>	0.00	106.40	106.40	0.00	240.26	240.26
Hunan provincial government	1.70	38.30	40.00	0.00	111.59	111.59
China Development Bank	0.00	319.20	319.20	0.00	325.59	325.59
<b>Total</b>	<b>314.20</b>	<b>463.90</b>	<b>778.10</b>	<b>312.29</b>	<b>677.43</b>	<b>989.72</b>

<sup>a</sup>. The Ministry of Communications was renamed the Ministry of Transport on 23 March 2008.

Sources: Asian Development Bank, Hunan Provincial Transportation Department, and Changji Expressway Construction and Development Company.

**PROJECTED AND ACTUAL CONTRACT AWARDS AND DISBURSEMENTS****Projected and Actual Contract Awards and Disbursements**  
(\$ million)

<b>Year</b>	<b>Contract Awards</b>			<b>Disbursement</b>		
	<b>Projected</b>	<b>Actual</b>	<b>Actual/Projected (%)</b>	<b>Projected</b>	<b>Actual</b>	<b>Actual/Projected (%)</b>
2004	0.00	0.00		0.00	0.00	
2005	65.00	230.77	355.03	15.00	61.62	410.80
2006	12.50	6.92	55.36	80.00	104.32	130.40
2007	50.00	49.28	98.56	75.00	57.68	76.91
2008	8.00	14.07	175.88	55.00	60.49	109.98
2009	0.00	6.01		16.00	11.44	71.50
2010	0.00	0.32		16.95	16.74	98.76
<b>Total</b>	<b>135.50</b>	<b>307.37</b>	<b>226.84</b>	<b>257.95</b>	<b>312.29</b>	<b>121.07</b>

Source: Asian Development Bank.

## APPRAISAL AND ACTUAL IMPLEMENTATION SCHEDULE

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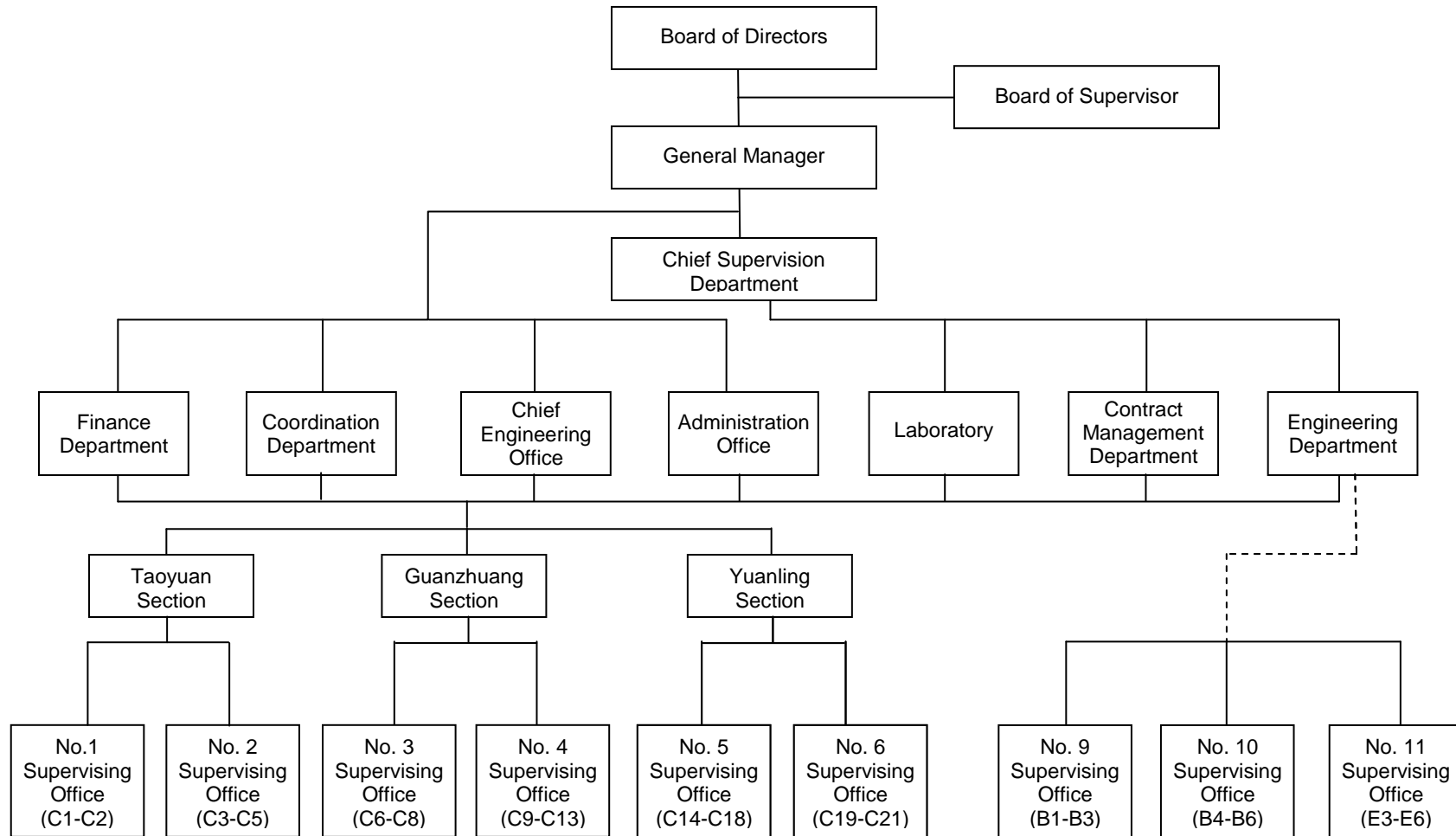
Notes: 1. Construction schedule (shown in Appendix 10, *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the People's Republic of China for the Hunan Roads Development II Project*) ends in 2007, while the estimated project completion date was 31 December 2009 in the main text of the RRP.

2. Schedule for local roads improvement was not included in the appraisal implementation schedule.

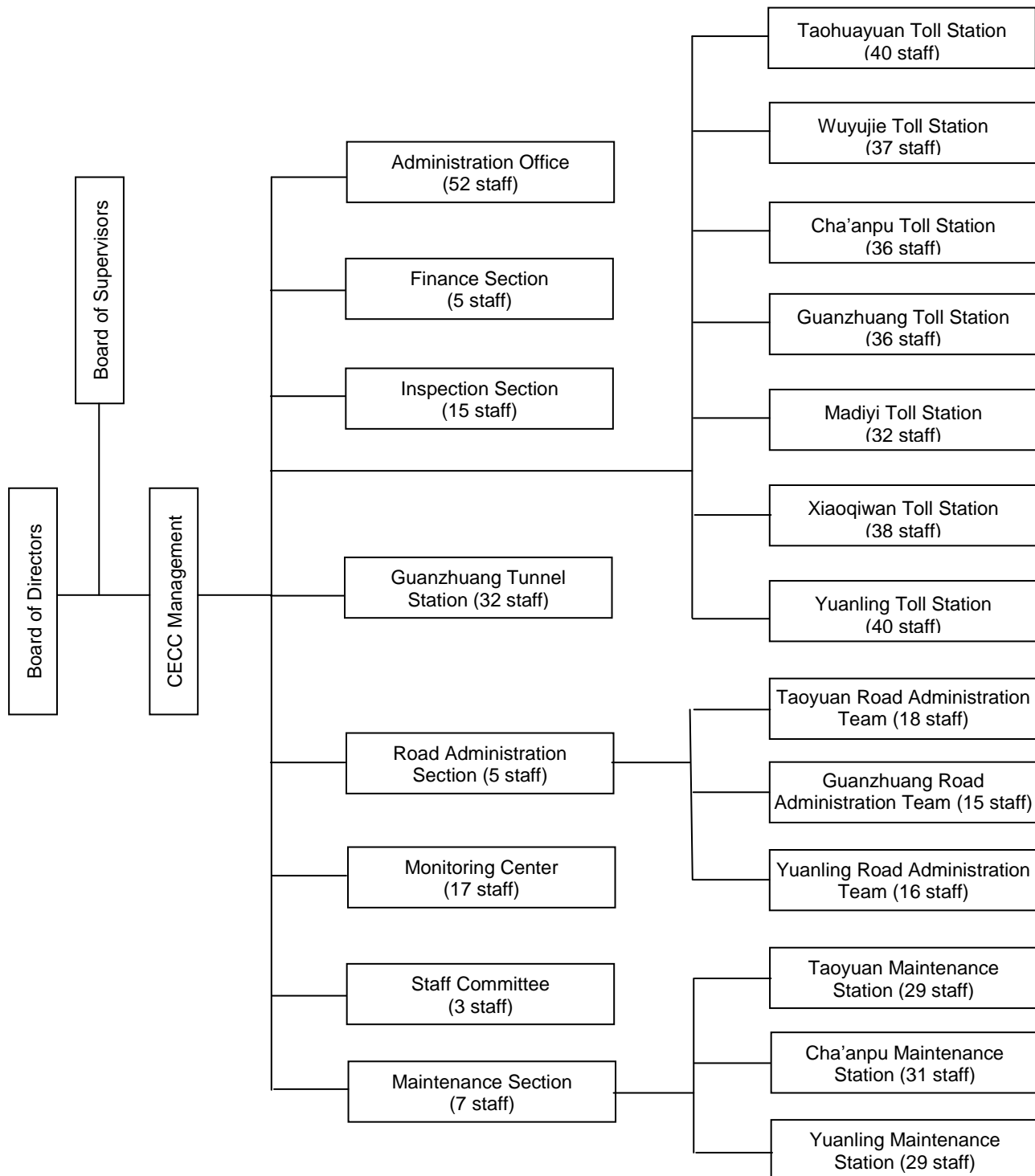
Sources: Asian Development Bank and Changji Expressway Construction and Development Company.

## Organization Charts of Changji Expressway Construction and Development Company

Figure A6.1: Organization Chart for the Construction Period



Source: Changji Expressway Construction and Development Company.

**Figure A6.2: Organization Chart for the Operation and Maintenance Period**

CECC = Changji Expressway Construction and Development Company.  
Source: CECC.

## COMPLIANCE WITH LOAN COVENANTS

Covenant	Reference to Loan Documents	Status of Compliance
HCD shall be the Project Executing Agency responsible for the overall implementation of the Project and implementation of the local road component of the Project through the concerned municipal and county communications bureau.	LA, Sch. 6, para. 1	Complied with. HCD is responsible for the overall implementation of the project expressway and local roads.
CECC shall be the Implementing Agency, responsible for coordinating and monitoring all construction activities of the Project expressway and operation and maintenance of the Project expressway. CECC's general manager, the Project director, shall be responsible for overall project management in respect of the Project expressway, the approval of contracts, and payments. A project implementation unit (PIU) established within CECC shall facilitate land acquisition, resettlement, and environmental protection measures, and ensure that local concerns are adequately addressed. PIU shall be headed by a Project manager, who will oversee day-to-day physical implementation activities and prepare progress reports.	LA, Sch. 6, para. 2	Complied with. CECC obtained business license on October 2005. CECC had sufficient technical qualified staff to undertake construction of the expressway. A contract management system was developed, Site office with resident engineers and supervision engineers was in-charge of the oversight of day-to-day constructions and quality control.
Construction Quality. HPG shall, through HCD, ensure that (i) the Project is constructed in accordance with the revised technical standards of highway engineering issued by the Borrower's Ministry of Communications; (ii) the local roads under the Project are upgraded, constructed, and maintained in accordance with national standards; and (iii) project construction supervision, quality control, and contract management are conducted in accordance with national standards and internationally accepted practices.	PA, Sch, para. 4	Complied with. The project expressway was built with prevailing international best practices and national standards. CECC conducted 18 technical studies, of which six were awarded with a national patent or a provincial certificate.
Road Safety. Six months prior to the commencement of operation of the Project expressway, (a) HPG shall cause HCD to, in coordination with the international consultant, develop, adopt and implement a plan, acceptable to HPG and ADB, for ensuring safe operation of the Project facilities; and (b) HPG shall establish teams of security personnel, in accordance with national and HPG standards, to patrol the Project expressway and enforce the national laws and regulations. HPG shall cause that HCD utilize its traffic control and surveillance systems to implement road safety measures for the Project and provide road safety education programs to local communities.	PA, Sch, para. 5	Complied with. Road accident rate of the expressway was lower than the parallel G319.
CECC shall (a) put in place the road safety signage, emergency communication system, traffic monitoring included in the Project design; and (b) take all appropriate measures in order to prevent overloading on the Project expressway by installing vehicle axle weighing and weighing scales equipment at the Project expressway tollgates.	PA, Sch, para. 6	Complied with. The weight based toll scheme became a national standard practice.

Covenant	Reference to Loan Documents	Status of Compliance
Operation and Maintenance Concession. HPG shall cause that HCD, with the help of an international consultant engaged under the Project, prepare the bidding document and the optimal framework for making the concession of the operation and maintenance of the Project expressway by 2006, which shall specify the concession period and selection criteria and ensure adequate pricing and transparent auctioning. HPG shall ensure that HCD submit it to ADB for review by 2006. HPG shall ensure that HCD advise ADB of the specific schedule of the operation and maintenance concession, when available.	PA, Sch, para. 10	Complied with. Draft concession of operation and maintenance was submitted to ADB in 2006. HPTD will advise ADB of the progress of implementation when the O&M concession was carried out.
Monitoring and Evaluation. HPG shall cause HCD to, and CECC shall, monitor and evaluate Project impacts through PPMS to ensure that the Project facilities are managed effectively and the benefits, particularly to the poor, are maximized. HPG shall cause HCD to, and CECC shall, collect PPMS data agreed with ADB prior to implementation of the Project, at completion of the Project, and annually for 3 years thereafter.	PA, Sch, para. 24	Complied with. An external monitor was engaged and 4 reports were submitted.
CECC shall ensure that (i) the Project be constructed and operated in accordance with national and local environmental procedures and guidelines, ADB's environmental procedures and guidelines and the EIA, (ii) any adverse environmental impacts arising from the Project be minimized by implementing the mitigating measures and environmental monitoring program presented in the EIA, and (iii) the implementation of the environmental management plan and any violation of environmental standards, if any (and the actions taken to remedy such violations), be regularly reported to ADB in accordance with the specifications set forth in the EIA.	PA, Sch, para. 15	Complied with. Four environment monitoring reports were submitted.
Vehicle Emissions. At least 6 months prior to the opening of the Project expressway, HPG shall provide ADB with the Hunan Environmental Protection Bureau (HEPB) emission standards and the penalties for infringement of such standards. HPG shall ensure that through the relevant agencies to HEPB vehicle emission standards as well as the national vehicle emission standards be enforced.	PA, Sch, para. 16	Complied with. The monitoring results for vehicle emissions showed that the level of NO <sub>2</sub> is below the Grade II limits of the national ambient air quality standards (GB3095-1996).
Land Acquisition and Resettlement. CECC shall (i) implement the RP in accordance with its terms; (ii) ensure that all land and rights-of-way required by the Project be made available in a timely manner; (iii) ensure that the provisions of the RP, including compensation and entitlements for affected persons (APs), be implemented in accordance with all applicable laws and regulations of the Borrower and ADB's <i>Policy on Involuntary Resettlement</i> ; (iv) ensure compensation and resettlement assistance be given to the APs prior to dispossession and displacement; (v) ensure that the counterpart fund for land acquisition	PA, Sch, para. 17	Complied with. Details are given in Appendix 11. CECC, local governments, and affected communities took various measures to help affected households restore their incomes, mainly (i) adjusting and reclaiming farmlands; (ii) improving irrigation systems; (iii) planting

Covenant	Reference to Loan Documents	Status of Compliance
and resettlement activities be timely provided; (vi) meet any obligations in excess of the RP budget estimate; and (vii) ensure that the APs will be at least well off as they would have been in the absence of the Project.		fruit trees and other cash crops, as well as rearing livestock; (iv) providing technical training and work as migrant laborers; and (v) recruiting some affected people as toll collectors. The external monitoring and evaluation report confirmed that restoring the incomes of affected people has been achieved.
CECC shall also ensure that (i) adequate staff and resources be committed to supervising and monitoring the implementation of the RP and to providing quarterly reports on such implementation to ADB, (ii) an independent agency acceptable to ADB be contracted to carry out monitoring and evaluation, and forward reports to ADB as specified in the RP, (iii) monitoring data be disaggregated by gender and monitoring focus on gender impacts and vulnerable groups, (iv) a summary of government audits of resettlement disbursements and expenditures be provided to ADB, and (v) local resettlement offices keep records of consultation and grievances and make such records available to ADB on request.	PA, Sch, para. 18	Complied with. CECC assigned sufficient staff to supervise and monitor the implementation of RP, reports were submitted to ADB, and external monitor was engaged, reports were prepared and submitted as required, local resettlement offices kept full documentation of consultation and grievances which were made available to ADB.
CECC shall update the RP (a) upon the completion of the detailed measurement survey as described in the RP and prior to the commencement of civil works, submit any such modifications to ADB for its concurrence and (b) as necessary to reflect any significant material changes in the Project scope or other causes, and submit any such changes to ADB for its approval. CECC shall ensure that civil works contract specifications includes requirements to comply with the RP and entitlements for permanent and temporary impacts to APs, and shall supervise the contractors to ensure compliance with requirements of the RP, applicable law, and ADB policy.	PA, Sch, para. 19	Complied with. The RP was updated timely and submitted to ADB for approval. During construction, the RP, PRC law and ADB policy were complied with by contractors and CECC supervised the compliance status.
HPG shall through HCD ensure that (a) any land acquisition carried out by the municipal or county communications bureaus for the local road component of the Project also be implemented in accordance with the RP, and (b) adequate resettlement compensation funds be available and properly utilized.	PA, Sch, para. 20	Complied with. Land acquisition and resettlement for local roads were carried out by Zhangjiajie and Yuanling local government and compensation funds are available and properly disbursed.
Poverty Reduction. CECC shall advise the contractors to maximize their employment of local poor people who meet the job and efficiency requirements for the construction of the Project facilities. HPG shall cause HCD to monitor the impacts of the Project on poverty in accordance with the	PA, Sch, para. 21	Complied with. Poverty incidence of Changde has been decreased to 10.2%, 9.6%, 9.1%, 8.6%, and 7.5% from 2006 to 2010, respectively.



Covenant	Reference to Loan Documents	Status of Compliance
guidelines set forth in the Project Performance Monitoring System (PPMS).		Poverty incidence of Huaihua has been decreased to 12.2%, 11.3%, 10.5%, 9.6%, and 9.0% from 2006 to 2010, respectively.
Ethnic Minority Development. HPG shall cause that HCD implement the Ethnic Minorities Development Plan (EMDP) and ensure that (i) ethnic minorities benefit from the Project in at least an equitable manner and in accordance with ADB's <i>Policy on Indigenous Peoples</i> ; (ii) ethnic minorities in the Project area are consulted and provided with full opportunity to participate in the implementation of EMDP; (iii) sufficient budget for implementation and monitoring of the EMDP be made available in a timely manner; (iv) any significant changes to EMDP be submitted to ADB for approval; and (v) implementation of EMDP be monitored and evaluated by an independent agency which will provide annual reports to ADB on the progress of EMDP implementation.	PA, Sch, para. 22	Complied with. Details are given in Appendix 12. A total of CNY112 million was invested in the reforestation of 124,788 mu in Yuanling County from 2004 to 2007. A total of 650,000 people benefited from the reforestation, and over 70% beneficiaries are minorities.
Gender and Development. CECC shall follow ADB's Policy on Gender and Development during Project implementation and take all necessary steps to encourage women living in the Project area to participate in planning and implementing the Project, including advising the contractors on maximizing employment of women in connection with the Project. HPG shall cause HCD to monitor under PPMS the Project's effects on women during Project implementation.	PA, Sch, para. 25	Complied with. The operation of expressway and local roads has promoted gender development in the project area. Improvement of road conditions enabled local women to access medical services, particularly for those women who live in the remote mountainous areas. For example, more women delivered babies in the hospital in recent years, with the percentage of hospital delivery reaching more than 99%. Improved transport conditions also promoted career development for local women in the local tourism services.
Health Risks. HPG, through HCD, and CECC, in coordination with the appropriate agencies identified by HPG, shall cause the contractors to disseminate information on the risks of socially and sexually transmitted diseases, including HIV/AIDS, to their employees during Project implementation. HPG shall, through HCD, cause the appropriate agencies to disseminate similar information to transport operators and to the communities in the Project area during Project implementation and operation of the Project facilities.	(PA, Sch, para. 26)	Complied with. A total of 7,000 pieces of HIV/AIDS prevention posters have been placed in 2005 and 2006 through CECC and contractors with assistance from the local disease control centers. In addition, the prevention education by films and videos were also organized, and many clinics have been opened in communities along the expressway.

Covenant	Reference to Loan Documents	Status of Compliance
<p>HPG through HCD shall maintain separate accounts for the local road from Zhangjiajie to Yuanling and CECC shall maintain separate accounts for the Project expressway. HPG through HCD and CECC shall, during the construction period and for the first 3 fiscal years of full commercial operation of the Project expressway, (i) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB; and (ii) furnish to ADB, promptly after their preparation but in any event not later than 6 months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the Loan proceeds and compliance with the covenants of the Loan Agreement as well as on the use of the procedures for statement of expenditures, all in the English language. HPG and CECC shall furnish to ADB such further information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request.</p>	PA, Section 2.09 (a)	Being complied with. Audit reports were submitted timely.
<p>Tolls. Six months prior to the commencement of operation of the Project expressway, HPG shall cause that HCD propose appropriate toll rates for the Project expressway in accordance with the Borrower's Highway Law, which requires that toll rates be set at levels sufficient to fulfill the debt service obligations of the Project expressway as well as maintain sound operation, management, and maintenance practices for the Project expressway.</p>	(PA, Sch, para. 7)	Complied with. The toll scheme was submitted to ADB as required.
<p>For the first 3 years of full commercial operation of the Project expressway, HPG shall cause that HCD, on an annual basis, review the toll structure and levels and report to ADB any significant difficulties in meeting the principles established under the Highway Law.</p>	PA, Sch, para. 8	Not yet due.
<p>Financial Performance Ratio. Except as ADB shall otherwise agree, CECC shall not incur, for each fiscal year commencing from the first day of the third year of the full operation of the Project expressway, any debt unless reasonable forecast of the revenues and the expenditures of CECC shows that the estimated net revenues of CECC for each fiscal year during the term of the debt to be incurred shall be at least 1.0 times the estimated maximum debt service requirements of CECC for any succeeding fiscal year on all debt of CECC, including the debt to be incurred.</p>	PA, Sch, para. 9(a)	Not yet due.

Covenant	Reference to Loan Documents	Status of Compliance
Nongovernment Financing. Six months prior to the commencement of the Project expressway operation, HPG shall cause that HCD analyze the feasibility of attracting nongovernment investment funds for future road sector investment, including private sector participation in the operation and maintenance of the Project expressway, and report its conclusions to ADB.	PA, Sch, para. 11	Complied with. HCD conducted an investigation on attracting external investors and finding/results were submitted to ADB.
The Borrower shall take, and shall cause HPG, through HCD, to take all necessary measures to ensure that (i) CECC can successfully construct the Project expressway; (ii) HPG and the local communication bureaus in the Project area can successfully construct, manage, and maintain the local roads; and (iii) the local roads construction and improvements are completed prior to the completion of the Project expressway.	LA, Sch. 6, para. 3	Complied with. The expressway and eight local roads were completed in or before 2008. One local road was completed in 2010 before loan closing.
The international consultants shall be selected and engaged as a firm by CECC using the quality-and-cost-based selection method in accordance with procedures outlined in Schedule 5 of the Loan Agreement.	LA, Sch.5, para. 4(a)-(e)	Complied with. The international consultants was engaged and mobilized in September 2005.
Prior to the start of civil works for the Project expressway, CECC, in consultation with HCD, shall develop and implement a human resources development plan, acceptable to ADB, that identifies the managerial, staffing, and investment requirements of CECC in relation to the Project and that includes an international training component to address these needs. For each following year, as an integral part of this human resources development plan, CECC shall prepare an annual training plan, including (i) the objectives of the training activities, (ii) number of the training participants, (iii) duration, (iv) cost estimates and (v) the program of workshops to be given to CECC employees by those who will participate in the international training. On completion of each international training, CECC shall submit to ADB an evaluation of the training.	PA, Sch, para13	Complied with. A total of 85 person-months through 14 overseas training were conducted. The knowledge acquired was disseminated. CECC organized a number of on-the-job training courses for approximately 1,040 persons.
HPG shall, through HCD, and CECC shall require that the persons participating in the international training workshops remain in the employment of the transport sector in Hunan Province, as the case may be, for a minimum period of 5 years after Project completion to ensure skills retention and continued implementation of workshops for other staff members.	PA, Sch, para. 14	Complied with. Key staff who benefited from international training continued to provide services to CECC and HCD.
In the event that the Borrower, HPG or CECC plan to make (a) any change in ownership of the Project facilitates, or (b) make any sale, transfer, or assignment of HPG's or CECC's interest in the Project expressway, or (c) lease out, or contract out, or otherwise modify CECC's responsibilities for operation and maintenance of the Project expressway, the Borrower shall, at least six	LA, Sch. 6, para. 4	Complied with. No change in ownership and operation.

<b>Covenant</b>	<b>Reference to Loan Documents</b>	<b>Status of Compliance</b>
months prior to implementation of such plan, consult ADB and obtain ADB's consent. The Borrower shall ensure that such transfer be made in a transparent manner.		
HPG and CECC shall furnish to ADB quarterly reports on the execution of the Project during the construction period and reports on the operation and management of the Project facilities as ADB may reasonably request. Such reports shall be submitted in such form and in such detail and within such a period as ADB shall reasonably request, and shall indicate, among the other things, progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and proposed program of activities and expected progress during the following quarter.	PA, Section 2.08 (b)	Complied with. Quarterly reports were submitted to ADB.

ADB = Asian Development Bank, AP = affected person, CECC = Changji Expressway Construction and Development Company, EMDP = ethnic minorities development plan, HCD = Hunan Provincial Communications Department, HIV = human immunodeficiency virus, HPG = Hunan Provincial Government, HPTD = Hunan Provincial Transportation Department, LA = loan agreement, PA = project agreement, para = paragraph, PRC = People's Republic of China, RP = resettlement plan, Sch = Schedule, TA = technical assistance.

Source: Asian Development Bank.

## EXPRESSWAY CIVIL WORKS AND EQUIPMENT PACKAGES

**Table A8.1: Expressway Civil Works Packages Financed by ADB**

No.	Contractor	Mode of Procurement	Contract Date	Country	Contract Amount	
					CNY	\$ Equivalent
C1	Hunan Road and Bridge Construction Group Corporation	ICB	19 August 2005	PRC	201,112,112	29,450,147
C2	Hunan Huaihua Road and Bridge Construction Corporation	ICB	19 August 2005	PRC	149,911,262	21,952,476
C3	Tianjin Fifth Municipal and Highway Engineering Company	ICB	19 August 2005	PRC	199,675,023	29,239,705
C4	Hunan Road and Bridge Construction Group Corporation	ICB	19 August 2005	PRC	182,676,281	26,750,469
C5	Yueyang Roads and Bridges Construction Company	ICB	19 August 2005	PRC	170,497,911	24,967,112
C6	Hunan Road and Bridge Construction Group Corporation	ICB	19 August 2005	PRC	223,564,562	32,738,005
C7	China Metallurgical Construction (Group) Corporation	ICB	19 August 2005	PRC	168,937,802	22,829,433
C8	Hunan Changde Road and Bridge Construction Company	ICB	19 August 2005	PRC	146,032,490	18,042,067
C9	Hunan Road and Bridge Construction Group Corporation	ICB	19 August 2005	PRC	203,466,501	25,137,942
C10	No.1 Construction Company of Limited Liability of China Railway Wuju Group Corporation	ICB	19 August 2005	PRC	199,170,449	24,607,172
C11	Hunan Huanda Road and Bridge Corporation	ICB	19 August 2005	PRC	135,354,289	16,722,793
C12	The 12th Bureau Group Company	ICB	19 August 2005	PRC	167,149,758	20,651,070
C13	Yueyang Tongqu Prosper Road Company	ICB	19 August 2005	PRC	99,896,038	12,341,986
C14	The 12th Bureau Group Company	ICB	19 August 2005	PRC	147,978,710	18,282,519
C15	Hunan Road and Bridge Construction Group Corporation	ICB	19 August 2005	PRC	152,917,194	18,892,660
C16	China Railway Tunnel Group Company	ICB	19 August 2005	PRC	238,728,888	29,494,550
C17	Hunan Road and Bridge Construction Group Corporation	ICB	19 August 2005	PRC	117,722,185	14,544,377
C18	No.2 Engineering Company of China Railway 11th Bureau Group	ICB	19 August 2005	PRC	209,363,855	25,866,550
C19	Hengyang Road and Bridge Construction Company	ICB	19 August 2005	PRC	118,525,519	14,643,627
C20	Hunan Huaihua Road and Bridge Construction Corporation	ICB	19 August 2005	PRC	167,111,610	20,646,357
C21	The Third Engineering Company of the Second Highway Engineering Bureau	ICB	19 August 2005	PRC	158,749,817	29,450,147
P1	Hunan Road and Bridge Construction Group Corporation	ICB	17 September 2007	PRC	212,744,495	28,333,821
P2	Hunan Road and Bridge Construction Group Corporation	ICB	17 September 2007	PRC	190,311,047	25,346,081
P3	Hunan Road and Bridge Construction Group Corporation	ICB	17 September 2007	PRC	153,369,136	20,426,069
P6	Huaihua Road and Bridge Construction Corporation	ICB	17 September 2007	PRC	137,213,446	18,274,415

ICB = international competitive bidding, No. = number, PRC = People's Republic of China.

Sources: Asian Development Bank, Hunan Provincial Transportation Department, and Changji Expressway Construction and Development Company.

**Table A8.2: Equipment Packages**

<b>No.</b>	<b>Item</b>	<b>Mode of Procurement</b>	<b>Date of Contract</b>	<b>Country of Procurement</b>	<b>Contractor</b>	<b>Original Contract Amount</b>	<b>\$ Equivalent</b>
1	Toll collections, communications and traffic surveillance	ICB	20 May 2008	PRC	Beijing RHY Technology Development Company	CNY61,525,207.19 +\$130,900.00	9,606,375.07
2	Toll collections, communications and traffic surveillance for all tunnels	ICB	20 May 2008	PRC	Telecom and Electrical Engineering Company, China Railway First Group	CNY31,359,000.00 +\$135,168.00	4,964,756.33

ICB = international competitive bidding, No. = number, PRC = People's Republic of China.

Sources: Asian Development Bank, Hunan Provincial Transportation Department, and Changji Expressway Construction and Development Company.

**Table A8.3: List of Upgraded Local Roads**

County	Code	Starting Point	Ending Point	Length (km)	Category	Original Technical Standard	Upgraded Technical Standard	Year of Completion
Yuanling	Y1	Yuanling	Zhangjiajie	126.6	County Road	Unclassified	Class III	2010
	Y2	Shengxikou	Wuqiangxi	147.0	County Road	Unclassified	Class IV	2009
	Y3	Wusu	Qingshuiping	13.0	Township Road	Unclassified	Class IV	2007
	Y4	Wusu	Luoheping	20.0	Township Road	Unclassified	Class IV	2007
	Y5	Maxipu	Zhuyuan	30.0	Township Road	Unclassified	Class IV	2005
Fenghuang	F1	Jishou- Fenghuang	Daxin	70.0	Provincial Road	Class IV	Class II	2007
Jishou	J1	Jishou	Huanyuan	35.0	National Road	Class IV	Class III	2005
Luxi	L1	Baisa	Sixin	53.6	County Road	Unclassified	Class IV	2007
Taoyuan	T1	Sandushui	Xi'an	14.4	Township Road	Unclassified	Class IV	2005
<b>Total</b>				<b>509.6</b>				

km = kilometer.

Source: Hunan Provincial Transportation Department.

## ECONOMIC REEVALUATION

### A. General

1. The project comprises a 174-kilometer (km) four-lane expressway from Changde to Huaihua and improvement of the local roads. The economic reevaluation was conducted for the expressway component. The reevaluation was undertaken using with- and without-project scenarios in accordance with the Asian Development Bank's *Guidelines for the Economic Analysis of Projects*.<sup>6</sup> Without the project, corridor traffic would use the existing national highway 319 (G319), which would be congested. This would result in higher vehicle operating costs (VOCs), longer travel time, and more road accidents. With the project, the corridor transport capacity was increased, allowing the vehicles on the project expressway to drive shorter distances, at faster speeds, and with lower operating costs. Congestion on the G319 was relieved, resulting in a shorter travel time and lower VOCs. Due to better transport conditions, traffic has been generated and operation costs in the corridor have been reduced. The evaluation period covered the implementation period from 2005 to 2010 and the operation period from 2009 to 2028. The analysis has been undertaken using 2011 constant prices.

2. The economic costs were derived from financial costs by excluding taxes, duties, and financing charges; applying a shadow wage rate of 0.75 on unskilled labor that has been utilized; and converting main construction material costs to economic prices.

### B. Revised Traffic Forecast

3. Traffic forecast for this project expressway was updated based on the information provided in the executing agency's project completion report. Actual expressway traffic in 2009 and 2010, corridor traffic, and the impact of connecting roads and the latest local socioeconomic development status were considered. The project expressway is one of the eight road corridors planned under the government's west development strategy, connecting Changsha and Chongqing. The section from Changsha to Changde was opened to traffic in 1998. The section from Jishou to Chadong (Chongqing border) is expected to be completed in 2012, and then the whole corridor expressway will be fully completed. The parallel G319 road extends from Xiamen in Fujian province to Chengdu in Sichuan province (520 km in Hunan province). The condition of G319 was poor with sections of technical standard class II, III, and IV. Traffic counts on G319 were 2,883 pcu in 2008 and 2,918 pcu per day in 2009, and 2,593 pcu in 2009 when the expressway was opened to traffic. In 2009, 47% of the corridor traffic used the project expressway, benefiting from better transport conditions and shorter distance, especially for passenger vehicles and through traffic. Some traffic on other expressways in the project area—the Changde to Zhangjiajie expressway and Shaoyang to Huaihua expressway—was diverted to the project expressway due to the shorter distance. Traffic increased by 34% in 2010, and it was estimated that the traffic on the project expressway (including generated traffic) would significantly increase (by 20%) in early years of operation during 2011–2012, then slow to 10%–15% during 2013–2019 and to 3%–5% during 2020–2028.

4. The actual traffic for 2008–2010, as well as the updated forecasted traffic, were significantly lower than the appraisal estimates (Table A9.1).

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<sup>6</sup> ADB.1997. *Guidelines for the Economic Analysis of Projects*. Manila.



**Table A9.1: Updated Traffic Forecast**

Year	Appraisal Estimates (MTE/day)			Updated Forecast (PCU/day)		
	Expressway	G319	Total	Expressway	G319	Total
2008–2009	6,613	3,291	<b>9,904</b>	2,341	2,593	<b>4,934</b>
2018	11,719	6,711	<b>18,430</b>	9,721	4,763	<b>14,484</b>
2028	19,419	12,841	<b>32,260</b>	12,437	6,982	<b>19,419</b>

MTE = medium truck equivalent (1 MTE = 2 PCU), PCU = passenger car unit.

Note: Traffic volume of section 1 at appraisal was used to represent the appraisal traffic projection, which does not affect the completion results and conclusions. The unit of MTE is no longer used in the PRC road sector.

Sources: Asian Development Bank and Changji Expressway Construction and Development Company.

### C. Benefits

5. The economic benefits that were quantified for the expressway component at appraisal included (i) savings in VOCs resulting from a shorter travel time and improved traffic conditions, (ii) savings in the value of passenger time, and (iii) benefits to generated traffic. These benefits were reevaluated with updated information. The benefits related to changes in road accidents were not considered due to lack of sufficient data on accident rates of the expressway and of the G319, both before and after the opening of the expressway.

6. Savings in VOCs are the main source of economic benefits. Unit VOC savings for each type of vehicle under different road and traffic conditions have been used in the calculation. VOCs were calculated based on fuel and lubricating oil consumption, tires and spare parts, vehicle maintenance labor costs, vehicle crew wages, vehicle depreciation, and average travel speed as a function of the geometrical condition of the road. VOC savings per vehicle kilometer (km) were estimated to be CNY1.07–CNY2.56 per vehicle km for the expressway traffic for different types of vehicles. VOC savings from the reduced travel distance were calculated. VOCs for traffic on the G319 were also reduced as a result of the reduced congestion. The unit VOC savings for G319 traffic is CNY0.49–CNY1.07 per vehicle km. For generated traffic, half of the VOC savings are considered as benefits. Table A4 provides the unit VOC saving values by vehicle type for the expressway and the G319.

**Table A9.2: Vehicle Operation Costs**  
(2011 prices, CNY/vehicle-km)

Item	Car	Bus	Small Truck	Medium Truck	Large Truck	Super Truck
Expressway	0.94	1.28	0.97	1.00	1.29	1.56
G319 (without)	2.01	2.92	2.53	3.40	3.46	4.12
G319 (with)	1.23	2.43	1.46	2.63	2.78	3.33
Savings (expressway)	1.07	1.64	1.56	2.40	2.17	2.56
Savings (G319)	0.78	0.49	1.07	0.77	0.68	0.79

G319 = national highway 319, km = kilometer.

Source: Changji Expressway Construction and Development Company.

7. Passenger travel time savings were estimated for different types of passenger vehicles. The average passenger time value was derived from the per capita income of Hunan province in 2010, and was assumed to rise by 6%–8% annually during 2011–2028, consistent with anticipated gross domestic product (GDP) growth rates. Other factors considered in recalculating travel time savings include average vehicle load, percentage of working trips, travel distance, and speeds under with- and without-project scenarios.

## D. Economic Internal Rate of Return Reevaluation

8. The reevaluated economic internal rate of return (EIRR) for the project expressway is 11.3%, which was significantly lower than the 18.6% estimated at appraisal. The lower EIRR was mainly due to the significantly lower traffic volume compared with traffic forecast at appraisal. The reevaluated EIRR was slightly lower than the cut-off rate of 12% (Table A9.3). If the net benefit of the local roads improvement is taken into account, the EIRR for the project reaches 12%.

9. Sensitivity analysis was carried out to test the impacts of (i) increased operation and maintenance (O&M) costs, (ii) decreased benefits, and (iii) a combination of these two scenarios (Table A9.4). The project's economic viability largely depends on the traffic volume and the improvement in road transport conditions. Completion of the expressways which are being constructed and will be connected to the project expressway during the next 5 years, with a total length of 7,273 km in Hunan province, will greatly enhance the connectivity of the expressway network and help the expected traffic growth to materialize.

**Table A9.3: Economic Reevaluation of the Project Expressway**  
(CNY million)

Year	Costs			Benefits			Net Benefits
	Capital	O&M	Total	VOC Savings	Time Savings	Total	
2005	1,785.01		1,785.01				(1,785.01)
2006	1,657.32		1,657.32				(1,657.32)
2007	1,103.37		1,103.37				(1,103.37)
2008	783.32		783.32				(783.32)
2009	182.17	44.37	226.54	260.00	106.30	366.30	139.76
2010	79.57	45.24	124.81	316.88	146.65	463.53	338.72
2011		45.53	45.53	362.96	171.39	534.35	488.82
2012		46.43	46.43	416.86	200.72	617.58	571.15
2013		47.36	47.36	480.05	235.52	715.57	668.21
2014		48.31	48.31	539.35	267.48	806.82	758.51
2015		49.30	49.30	606.52	303.96	910.48	861.18
2016		50.31	50.31	656.58	331.55	988.13	937.82
2017		51.35	51.35	711.11	361.76	1,072.8	1,021.52
2018		52.42	52.42	770.54	387.53	1,158.0	1,105.65
2019		53.53	53.53	835.34	423.10	1,258.4	1,204.90
2020		54.67	54.67	905.99	462.06	1,368.0	1,313.38
2021		55.84	55.84	948.59	484.46	1,433.0	1,377.20
2022		57.05	57.05	993.21	507.95	1,501.1	1,444.10
2023		58.30	58.30	1,039.94	532.59	1,572.5	1,514.23
2024	703.20	59.58	762.77	1,088.90	558.42	1,647.3	884.55
2025		60.90	60.90	1,140.18	585.52	1,725.7	1,664.80
2026		62.26	62.26	1,174.39	603.09	1,777.4	1,715.22
2027		63.66	63.66	1,209.62	621.18	1,830.8	1,767.14
2028	(1,807.08)	65.10	(1,741.98)	1,245.91	639.82	1,885.7	3,627.70

**EIRR = 11.3%**

( ) = negative, O&M = operation and maintenance, VOC = vehicle operating cost, EIRR = economic internal rate of return.

Source: Asian Development Bank.

<b>Table A9.4: Sensitivity Analysis</b>			
<b>Item</b>	<b>Changes</b>		<b>EIRR</b>
	<b>O&amp;M Cost</b>	<b>Benefits</b>	
Base Case			<b>11.3%</b>
Changes (+/-)	+20%		<b>11.2%</b>
		-10%	<b>10.3%</b>
		-20%	<b>9.2%</b>
	+20%	-20%	<b>9.1%</b>

EIRR = economic internal rate of return, O&M = operation and maintenance.

Source: Asian Development Bank.

## FINANCIAL REEVALUATION

### A. Introduction

1. The financial reevaluation was undertaken in accordance with the Asian Development Bank's *Guidelines for the Financial Management and Analysis of Projects*.<sup>7</sup> The project had both revenue and nonrevenue components. The 174-kilometer (km) four-lane expressway from Changde to Huanhua is the revenue component under the project. The expressway is operated by the Changji Expressway Construction and Development Company (CECC), which is one of 17 affiliates of the Hunan Provincial Expressway Management Bureau (HPEMB). Financial reevaluation was conducted on the revenue-generating component. The evaluation period covers the implementation period of 2005–2009 and the operation period of 2009–2028.

### B. Basic Assumptions

2. For financial internal rate of return (FIRR) calculation, the capital cost is based on actual expenditures incurred for the expressway, excluding the cost for interest during construction. The actual capital cost denominated in local currency was about 0.2% higher than the appraisal estimates. The expressway operation and maintenance (O&M) expenses were estimated based on the actual expenses of the HPEMB for O&M of the project expressway. The expressway maintenance cost comprises CNY60,000 per km for routine maintenance and CNY4.4 million per km for repavement, which is scheduled in 2024. The operation cost is estimated based on the average salaries and number of employees for expressway administration and operation. It was assumed that the operation cost and routine maintenance cost would increase by 3% in real terms annually to ensure the good working condition of the expressway facilities. Depreciation was calculated using an average depreciation ratio of 5%, and depreciation expenses were excluded from the FIRR calculation.

**Table A10.1: Toll Rates for Project Expressway**  
(CNY per vehicle-km)

Vehicle Type	Vehicle Standards		Toll Rates
	Freight Vehicle	Passenger Vehicle	
Type 1	$M \leq 2t$	$N \leq 12$	0.50
Type 2	$2t < M \leq 5t$	$13 \leq N \leq 19$	1.10
Type 3	$5t < M \leq 11t$	$20 < N \leq 49$	0.80
Type 4	$11t < M \leq 18t$	$50 \leq N$	1.40
Type 5	$18t < M \leq 25t$		1.70
Type 6	$25t < M$		2.20

km = kilometer, M = standard freight vehicle load (tonnage), N = standard passenger vehicle seats, t = tonnage.  
Source: Changji Expressway Construction and Development Company.

3. The project expressway will generate financial benefits by collecting tolls. The actual toll revenues for 2009–2010 were included and the future toll revenues will increase consistent with the traffic growth. Current toll rates (Table A10.1), with a base toll level of CNY0.50 for a passenger car unit (pcu) per km, have been charged to expressway users since 2010. The overall toll level is higher than the appraisal estimates. There was no increase in toll rates in real terms as the traffic level is significantly lower than the appraisal estimates. Non-toll vehicles, including trucks for fresh agriculture products, account for 5% of total traffic. The CECC confirmed that no business tax or corporate income tax is charged on the expressway as the operating entity, and the HPEMB (including its affiliates), is an administrative unit and not a

<sup>7</sup> ADB. 2005. *Financial Management and Analysis of Projects*. Manila.

corporate entity. All revenues and expenses were expressed in 2011 prices for the FIRR calculation. The residual value of fixed assets was based on the economic life of expressway facilities.

### C. Financial Internal Rate of Return

4. The FIRR was recalculated as 6.00% (Table A10.2) which is lower than the appraisal estimate of 7.63%. The decrease in FIRR was due to higher capital cost, higher repavement and operation and maintenance (O&M) costs, and lower traffic, combined with higher toll and tax factors (para. 3). The after-tax weighted average cost of capital (WACC) in real terms was calculated using the actual financing mix and related cost of various financing sources. The revised WACC is 3.7%, lower than the appraisal estimate of 4.4%. The project's recalculated FIRR is higher than the revised WACC, and the project is considered financially viable.

**Table A10.2: Financial Internal Rate of Return**  
(CNY million)

Year	Costs			Revenue	Net Cash Flow
	Capital	O&M	Total		
2005	1,851.75		1,851.75	0.00	(1,851.75)
2006	1,810.51		1,810.51	0.00	(1,810.51)
2007	1,205.36		1,205.36	0.00	(1,205.36)
2008	855.73		855.73	0.00	(855.73)
2009	199.01	48.48	247.49	109.81	(137.68)
2010	86.93	49.42	136.35	147.47	11.12
2011		49.74	49.74	176.96	127.22
2012		50.73	50.73	221.54	170.82
2013		51.74	51.74	276.77	225.03
2014		52.78	52.78	331.28	278.50
2015		53.85	53.85	447.44	393.59
2016		54.96	54.96	533.64	478.68
2017		56.10	56.10	567.36	511.26
2018		57.27	57.27	695.56	638.29
2019		58.48	58.48	794.87	736.39
2020		59.72	59.72	897.42	837.70
2021		61.00	61.00	972.69	911.68
2022		62.32	62.32	1,043.55	981.23
2023		63.68	63.68	1,117.35	1,053.66
2024	768.20	65.08	833.28	1,202.27	368.99
2025		66.53	66.53	1,285.17	1,218.64
2026		68.01	68.01	1,366.02	1,298.00
2027		69.54	69.54	1,408.01	1,338.47
2028	(1,974.12)	71.12	(1,903.00)	1,458.12	3,361.12
					<b>FIRR = 6.0%</b>

( ) = negative, FIRR = financial internal rate of return, O&M = operation and maintenance.  
Sources: Asian Development Bank and Hunan Provincial Transportation Department.

5. Sensitivity analysis was conducted to test the impacts of variations in O&M costs and revenues. The results indicate that the project will remain financially viable under various sensitivity tests. The project's FIRR will remain above the WACC if the revenue is 20% lower than forecast and the O&M cost is 20% higher than forecast (Table A10.3).

**Table A10.3: Sensitivity Analysis**

Item	Change in		FIRR
	O&M Cost	Revenue	
Base Case	0%	0%	6.0%
Change	+20%	–10%	5.9%
		–20%	5.2%
		–20%	4.4%
	+20%	–20%	4.3%

FIRR = financial internal rate of return, O&M = operation and maintenance.

Source: Asian Development Bank.

#### **D. Financial Performance of Changji Expressway Construction and Development Company**

6. The CECC was established in 2004 for the construction and operation of the project expressway. At appraisal, it was anticipated that, during the project's initial years of operation, O&M of the project expressway would be the responsibility of the CECC. According to the project agreement, the CECC shall comply with the financial covenant on debt service coverage ratio of not less than 1 starting from the third year of full operation of the project expressway. The financial performance evaluation was undertaken on a pro forma basis, focusing on the debt repayment capacity of the project expressway.

7. The analysis indicated that the debt service coverage ratio of not less than 1 would only be achieved in 2016. It was explained in the executing agency's project completion report that cross-subsidy from other expressways under the HPEMB would be relied on to cover the shortage of internally generated cash flows in the initial years of operation. The government was informed by the Asian Development Bank of the issues of a high debt ratio (about 72%), the loan interest and principal repayment burden, high OM costs, and low traffic levels. Completing the missing links of the expressway network, improving the connectivity of toll roads and non-toll roads, and providing better transport services would be important for the project expressway to generate adequate revenues to comply with the loan covenant. It is also important to improve the efficiency of O&M of the expressway and exercise effective control of its operating costs.

## LAND ACQUISITION AND RESETTLEMENT

### A. Background

1. The Asian Development Bank (ADB) approved a resettlement plan for the expressway component during the loan processing, and an updated resettlement plan on the basis of detailed design was prepared and submitted to ADB in June 2004. According to the updated resettlement plan, 20,234 *mu* (1,348.9 hectares [ha]) of land would be acquired permanently under the project (7,639 *mu* of which was farmland) and 30,564 people would be affected by permanent land acquisition.<sup>1</sup> A total of 225,139 square meters (m<sup>2</sup>) of houses or buildings would be demolished and it would cause the relocation of 1,414 households with 4,807 people. In addition, the project would acquire about 4,345 *mu* of temporarily borrowed land for construction purposes. The resettlement cost estimate of CNY434,501,601 was included in the project cost estimates. Two resettlement plans were prepared and submitted to ADB—for the Yuanling section in 2006 and for the Zhangjiajie section of Zhangjiajie–Yuanling highway in 2007.<sup>3</sup> Land acquisition and resettlement for the expressway had commenced by the end of 2003 and most of the activities were completed by the end of 2004. In addition, the supplementary compensation fund was provided to affected communities and affected households by the end of 2008 due to national policy updates.

### B. Scope of Land Acquisition and Resettlement

2. According to the project completion report prepared by the Changji Expressway Construction and Development Company (CECC), the project permanently acquired 19,613 *mu* (1,307.5 ha) of land, 3.1% less than the estimated area. A total of 418,746 m<sup>2</sup> of buildings were demolished, 78.2% more than estimated. A total of 47,417 people were affected by land acquisition and 8,280 people were affected by house demolition. The major reason for the significant increase in house demolition was that some houses close to the expressway were threatened by potential landslides, and they were also relocated as requested by the local people. The increase in people affected by land acquisition was mainly due to the readjustment of farm lands in most of the affected villages in Dingchen district after land acquisition; although more villagers were affected, the impact degrees were lower. Table A11.1 presents the actual project impacts versus those estimated in the updated resettlement plan.

**Table A11.1: Expressway Project Land Acquisition and Resettlement Impacts**

Item	Unit	Impacts		Variation	
		RP	Actual	Quantity	Percentage
A. Permanent Land Acquisition	<i>mu</i>	20,234	19,613	(621)	(3.1)
Included Farmland	<i>mu</i>	7,639	9,009	1,370	17.9
B. Temporary Land Use	<i>mu</i>	4,345	5,650	1,305	30.0
C. Building Demolition	m <sup>2</sup>	235,003	418,746	183,743	78.2
C1. Private Houses	m <sup>2</sup>	225,139	404,120	178,981	79.5
C2. Schools /Enterprises	m <sup>2</sup>	9,864	14,626	4,762	48.3
D. Population Affected					
D1. By land acquisition	Persons	30,564	47,417	16,853	55.1
D2. By building demolition	Persons	4,807	8,280	3,473	72.2

( ) = negative, m<sup>2</sup> = square meter, *mu* = 666.67 m<sup>2</sup>, RP = updated resettlement plan.

Sources: Updated resettlement plan and Changji Expressway Construction and Development Company.

<sup>1</sup> A *mu* is a Chinese unit of measurement (1 *mu* = 666.67 m<sup>2</sup>).

<sup>3</sup> The Zhangjiajie–Yuanling highway is a local road financed by ADB.

3. The land acquisition and resettlement impacts of the Zhangjiajie–Yuanling highway were unknown during loan preparation stage. Separate resettlement plans were prepared and submitted to ADB in 2006 and 2007, as per loan covenant. During implementation, the Zhangjiajie–Yuanling highway was constructed in two sections by two different implementing agencies, one for the Zhangjiajie section and another for the Yuanling section. On the Zhangjiajie section 1,310 mu of land was permanently acquired and 55,362 m<sup>2</sup> houses and/or buildings were demolished, which affected 261 households. On the Yuanling section, 689 mu of land was permanently acquired and 52,122 m<sup>2</sup> houses and/or buildings demolished, which affected 427 households.

### C. Resettlement Policy and Compensation Rates

4. Land acquisition and resettlement were implemented based on the Land Administration Law (1998) of the People's Republic of China (PRC), ADB's Involuntary Resettlement Policy (1995) and Policy on Indigenous Peoples (1998), the Implementation Measures for the Land Administration Law of the PRC in Hunan Province (2000), and the Hunan Provincial Government's Management Measures on Temporary Land Occupation (2001). The compensation rates for permanent land acquisition (first payment in 2004) under the project as compared with the resettlement plan are given in Table A11.2. It is noted that the implemented compensation rates for irrigated land were similar to those in the resettlement plan, but the compensation rates for dry land were 20% lower than those in the resettlement plan.

**Table A11.2: Compensation Rates for Permanent Land Acquisition**  
(CNY/mu)

County	Land Type	RP Rate	Actual Rate	Variation
Dingcheng	Irrigated land	10,440	9,600	(8.0%)
	Dry land	6,000	4,900	(18.3%)
Taoyuan	Irrigated land	9,360	9,400	0.4%
	Dry land	6,000	4,700	(21.7%)
Yuanling	Irrigated land	8,760	9,300	6.2%
	Dry land	6,000	4,650	(22.5%)

( ) = negative, mu = 666.67 m<sup>2</sup>, RP = updated resettlement plan.

Note: First payment in 2004.

Sources: Updated resettlement plan and Changji Expressway Construction and Development Company.

5. The government launched a significant reform policy on land acquisition (No. 28 Decree by the State Council of PRC) in October 2004 and there was a subsequent policy update by the Hunan provincial government in April 2005. According to the updated policy, the Hunan Provincial Transportation Department (HPTD) would provide supplementary compensation to the project-affected people who lost their farmland. A total of CNY36.34 million of the supplementary compensation funds were disbursed to Huaihua and Changde prefecture governments in June 2005. Subsequently, supplementary compensation for farmland acquisition was disbursed to affected people in Huaihua prefecture in October 2006 and in Changde prefecture in December 2008. According to the supplementary compensation scheme, the compensation rate for dry land was increased to CNY6,250/mu, and the rate for irrigated land was increased to CNY12,500/mu, which were higher than those in the resettlement plan (Table A11.3).

6. The original RP prepared during PPTA included proposed rates for rural housing (see Table A11.4). Prior to implementation, the RP was updated based on further investigation of local replacement costs for rural housing (also shown in Table A.11.4). Although these were lower than originally proposed, ADB approved these rates as they met the IR Policy requirement of replacement cost. It was confirmed



that the actual rates were based on replacement cost and there was a range of rates which reflected variations in house quality. The APs were generally satisfied with these rates as it provided them with cash to construct better homes.

**Table A11.3: Compensation Rates for Permanent Land Acquisition**  
(CNY/*mu*)

County	Land Type	RP Rate	Actual Rate	Increase	
				Amount	Percentage
Dingcheng	Irrigated land	10,440	12,500	2,060	20
	Dry land	6,000	6,250	250	4
Taoyuan	Irrigated land	9,360	12,500	3,140	34
	Dry land	6,000	6,250	250	4
Yuanling	Irrigated land	8,760	12,500	3,740	43
	Dry land	6,000	6,250	250	4

*mu* = 666.67 m<sup>2</sup>, RP = updated resettlement plan.

Note: With supplementary compensation in 2006 and 2008.

Sources: Updated resettlement plan and Changji Expressway Construction and Development Company.

**Table A11.4: Compensation Rates for House Demolition**  
(CNY/m<sup>2</sup>)

House Structure			Dingcheng	Taoyuan	Yuanling
Brick and concrete	Actual		210–320	210–320	220–260
	RP	Proposed Rate	280	280	280
		Replacement Cost	233	220	206
Brick and tile	Actual		140–160	140–160	170–200
	RP	Proposed Rate	220	220	220
		Replacement Cost	162	156	145
Clay and tile	Actual		100	100	120–140
	RP	Proposed Rate	180	180	180
		Replacement Cost		105	90
Wood and tile	Actual		120	120	70–100
	RP	Proposed Rate	160	160	160
		Replacement Cost			
Simple house	Actual		60	60	30–50
	RP	Proposed Rate	90	90	90
		Replacement Cost	60	55	50

m<sup>2</sup> = square meter, RP=updated resettlement plan.

Sources: Updated resettlement plan and Changji Expressway Construction and Development Company.

## D. Rehabilitation and Income Restoration

7. The affected villagers received house compensation and rebuilt their houses within the village. Each affected household was offered a legitimate house plot without any payment, and construction of new houses took 3–5 months. Most new houses had two floors, and were of better quality than those houses which were not affected. In addition to those affected households within the red line of the expressway, 117 households beyond the red line were relocated at the request of affected people as they were located close to or adjacent to the expressway.

8. The affected villages received the first land compensation payments in 2004, and supplementary land compensation payments in 2006 and 2008; in total, the compensation rates

were higher than those in the updated resettlement plan. The use of land acquisition compensation was different in different villages. For most affected villages in Dingcheng and Taoyuan counties, the affected people received replacement land through land readjustment within the village or group, and the land compensation was either distributed among all villagers in the village or used for improvement of village public facilities such as roads, irrigation systems, and schools. In affected villages in Yuanling county, all compensation was provided to the affected families so there was no land readjustment. Most of the affected families still have adequate farmland after land acquisition under the project.

9. Local poverty reduction offices, agriculture bureaus, animal husbandry bureaus, and labor bureaus in the affected counties along the alignment regularly provided trainings to affected people in order to improve their skills in farming, animal husbandry, as well as in nonagricultural jobs. Since 2004, the so-called Sunshine Program initiated by the central government has been implemented in the project area. Many affected people benefited from this program and found nonagricultural jobs after receiving skills training. In addition, tourism development in the project area provided job opportunities for affected people. The external monitoring and evaluation report indicated that the percentage of wage income versus net income per capita increased from 49.9% in 2003 to 72.5% in 2008.

10. The external resettlement monitor conducted the baseline survey of 480 sample households in early 2004, and tracked income changes of those households in 2006, 2007, and 2008. According to the external resettlement monitoring and evaluation report, the average per capita net income of sample affected households increased from CNY1,528 in 2003 to CNY4,034 in 2008 (Table A11.5).

**Table A11.5: Income Restoration of Affected Sample Households**  
(CNY/person)

Item	2003		2008	
	Income	Percentage	Income	Percentage
A. Wage income	1,528	49.9	4,034	72.5
In which: migrant labor income	1,181	38.5	3,137	56.4
B. Net income of operating business	1,330	43.4	1,376	24.7
In which: agriculture (farm, forestry, and fishery)	817	26.7	974	17.5
C. Property net income	153	5.0	79	1.4
D. Transferred income	52	1.7	78	1.4
<b>Net income per capita</b>	<b>3,064</b>	<b>100.0</b>	<b>5,567</b>	<b>100.0</b>

Sources: Project resettlement monitoring reports.

## **E. Resettlement Cost**

11. Implementation of land acquisition and resettlement cost CNY403.69 million, which was an increase of 2% on the CNY395.796 million in the updated resettlement plan excluding contingency.

## **F. Information Disclosure, Consultation, and Participation**

12. Resettlement management offices of project-affected counties along the expressway alignment made public announcements twice on resettlement policies as well as land acquisition and relocation prior to the implementation of land acquisition and resettlement. On the first occasion it was to let project-affected persons know the detailed compensation policy

and rates, and to publicly disclose the scope of land acquisition and house demolition, resettlement policies, and detailed compensation standards. The second announcement was on the specific amount of land acquisition and house relocation, as well as the amount of compensation fund. These two public announcements were to ensure that affected people were informed in a timely and adequate manner at key milestones during resettlement planning and preparation, and any errors identified could be corrected in a timely manner. Resettlement management offices took various measures to communicate with project-affected people through public announcement cars, radio, television programs, posters, newspapers, bulletins, village message boards, and resettlement booklets.

13. Based on the information disclosure, the consultation and participation on land acquisition, house demolition, compensation, relocation, and rehabilitation were extensively conducted with the affected communities and affected people. The CECC worked closely with the county resettlement management offices, township governments, as well as village communities, and organized many open consultative meetings to make sure the voices and opinions from affected communities and affected people were heard. Utilization and distribution of land compensation and readjustment of farmlands within affected villages were also extensively discussed through village meetings. In addition, an appropriate complaints handling mechanism was established under the project. Project-affected people could appeal to local officials, contractors, or resettlement management offices when they encountered any problems. In this way, some resettlement issues during project implementation, such as damage to houses due to blasting operations, were identified and resolved in a timely manner.

#### **G. Institutional Arrangement**

14. Resettlement procedures followed the resettlement plan and were characterized by transparent management and direct payment of compensation to affected villages and people through county project management offices. A resettlement management office consisting of six full-time staff was established in the CECC, and the three project counties (Dingcheng, Taoyuan, and Yuanling) also set up land acquisition and resettlement offices, which comprised 5–8 local officials from various county government departments including transport, land administration, environment protection, and forest administration. Overall resettlement implementation was coordinated by provincial project management offices, and was led by the vice-governor of the Hunan provincial government.

#### **H. Monitoring and Evaluation**

15. Hunan University was engaged for external monitoring and evaluation (M&E) of land acquisition and resettlement implementation. External resettlement M&E for the expressway has been conducted periodically. Four resettlement M&E reports—for 2004, 2007, 2008, and 2009—were submitted to ADB. The first M&E report prepared in June 2004 during the peak of land acquisition and resettlement implementation was inadequate, particularly in the analysis of income restoration of affected households. Based on ADB's comments, the subsequent M&E reports followed up the income changes of affected houses by tracking those affected households surveyed in the baseline survey in early 2004. The last external M&E report submitted in 2009 concluded that income restoration of affected households had been achieved.

## **I. Lessons**

16. The project shared common resettlement issues with other expressway projects in the PRC. Subsequent expressway projects may benefit from some experience and lessons learned from the project:

- (i) early accomplishment of major land acquisition resettlement activities prior to commencement of civil works ensures adequate time for resettlement implementation as well as timely contract awards for civil works;
- (ii) instead of concentrated resettlement sites, allocation of individual housing plots enables affected households to move into new houses in a timely manner, but this approach has to be decided on based on the local context;
- (iii) building good relationships with local communities through appropriate assistance in the improvement of local community facilities, such as schools and access roads, is valuable; and
- (iv) some adverse impacts caused by construction activities should be identified during project design stage, such as damage to houses and interruption of community water supply, irrigation, and drainage systems.

## **SOCIAL IMPACT AND ETHNIC MINORITY DEVELOPMENT**

### **A. Introduction**

1. During project preparation, a social and poverty analysis was conducted. According to the analysis, the project will contribute to regional development and poverty reduction through (i) improved access to markets and social services for the poor, (ii) lower transport costs of agriculture inputs and products, (iii) better access to and interaction with other regions, and (iv) employment opportunities during construction and after completion because of increased economic activities. The expressway will help accelerate economic growth, spur interregional trade, and reduce poverty in the project area. The project also includes a local road component, which aims to improve the mobility of rural poor people and improve access to economic opportunities, and thereby contribute to poverty reduction. A social action plan was also prepared to identify a number of measures to achieve the objective of enhancing positive impacts (e.g., poverty reduction) and mitigating negative impacts (e.g., resettlement). In addition, given that the project is located in an ethnic minority area, an ethnic minority development plan was prepared and included measures similar to those in the social action plan to extend the project benefits to local minority groups in a culturally appropriate way.

### **B. Socioeconomic Growth in the Project Area**

2. Construction of the project expressway commenced in 2005, and it was opened to traffic in December 2008. A total of CNY6.43 billion was invested in expressway construction. The generated income, employment, and business opportunities, and potential to attract external investment, have contributed significantly to regional socioeconomic growth in the project area and in Hunan province as a whole. The statistics show that annual per capita gross domestic product (GDP) of Dingcheng district, Taoyuan county and Yuanling county increased markedly from 2004 to 2010—in Dingcheng district by 176%, in Taoyuan county by 134%, and in Yuanling county by 157% (Table A12.1).

3. Construction of the expressway has facilitated external investments and contributed to local industrial development along the expressway. According to the second socioeconomic monitoring report prepared by Hunan University, in 2007 Dingcheng district attracted external investments of \$18.16 million, Taoyuan county attracted \$18.88 million, and Yuanling county attracted CNY1.5 billion. By the end of 2010, the secondary and tertiary industries in Dingcheng district accounted for 71% of total GDP, in Taoyuan county 65%, and in Yuanling county 89%, which were higher than the figures in 2004. Detailed data as presented in Table A12.1.

4. Operation of the expressway and improvement of local roads has promoted transport development for both passengers and cargo. The travel time from Yuanling to Dingcheng has been significantly reduced, from 5 hours to 2 hours. It was also observed that the number of buses and cars within each county increased along the expressway alignment, which led to a deferred increase in ticket price due to increased competition and benefits to local communities. In addition, the project has promoted economic development. For example, the total freight turnover volume of Taoyuan county increased by 39.5%, from 425 million tons per kilometer (km) in 2004 to 593 million tons/km in 2009.

5. Operation of the expressway and improvement of local roads has also promoted tourism development in the project area. Local governments have taken measures to develop tourism resources by taking advantage of expressway transportation. Connecting roads from the expressway to scenic spots were constructed by the local governments to attract travelers. For

example, in 2009 47,000 tourists visited Huayanxi, one of the local scenic spots in Taoyuan county, with an increase of 11.9% as compared 42,000 tourists in 2008. There are many scenic spots and tourism resources in the project area but most of them were not well-known due to access difficulties. The expressway will attract more tourists from Zhangjiajie, a famous tourism city, to the counties along the expressway, particularly Taoyuan and Yuanling.

**Table A12.1 Growth of Gross Domestic Product in the Project Area**

Project Area	Year	Per Capita GDP (CNY)	Growth Rate (%)	Structure of GDP (%)	
				Primary Industry	Secondary and Tertiary Industries
Dingcheng	2004	6,952		42	58
	2005	7,964	14.56	40	60
	2006	9,058	13.74	38	62
	2007	10,630	17.35	38	62
	2008	13,038	22.65	35	65
	2009	15,258	17.03	32	68
	2010	19,045	24.82	29	71
Taoyuan	2004	7,449		45	55
	2005	8,407	12.86	43	57
	2006	9,461	12.54	41	59
	2007	11,371	20.19	41	59
	2008	13,197	16.06	36	64
	2009	14,759	11.84	44	56
	2010	17,401	17.9	36	65
Yuanling	2004	6,380		17	83
	2005	7,448	16.74	17	83
	2006	8,552	14.82	15	85
	2007	10,669	24.75	15	85
	2008	12,259	14.9	14	86
	2009	13,543	10.47	12	88
	2010	16,385	20.99	11	89
Hunan Province	2004	9,165		21	80
	2005	10,426	13.76	19	81
	2006	11,950	14.62	18	82
	2007	14,405	20.54	18	82
	2008	17,521	21.63	18	82
	2009	20,428	16.59	15	85
	2010	24,719	21.01	15	85

GDP = gross domestic product.

Sources: 2005–2011 statistical yearbooks of project counties and Hunan province.

### C. Poverty Reduction

6. With the socioeconomic growth in the project area and the increased fiscal revenue of the local governments, living standards and income of local people—particularly the poor—have improved. The statistics show that, from 2004 to 2010, annual rural per capita income of farmers increased significantly—by 91% in Dingcheng district, 83% in Taoyuan county, and 91% in Yuanling county (Table A12.2).

**Table A12.2: Growth of Per Capita Income of Farmers in Project Area**  
(CNY/person)

Year	Dingcheng		Taoyuan		Yuanling	
	Per Capita Rural Income	Growth (%)	Per Capita Rural Income	Growth (%)	Per Capita Rural Income	Growth (%)
2004	2,981		2,963		1,375	
2005	3,276	9.9	3,216	8.5	1,475	7.3
2006	3,611	10.2	3,537	9.9	1,595	16.0
2007	4,029	11.6	3,946	11.6	1,721	7.9
2008	4,484	11.3	4,405	11.6	1,940	12.7
2009	4,941	10.2	4,816	9.3	2,184	12.6
2010	5,698	15.3	5,419	12.5	2,626	20.2

Sources: 2005–2011 statistical yearbooks of project counties and Hunan province.

7. Poverty incidence has also been significantly reduced in the project area. The statistics show that, from 2004 to 2010, poverty incidence decreased from 11.5% to 5.6% in Dingcheng district, from 11.6% to 6.5% in Taoyuan county, and from 21.6% to 15.3% in Yuanling county (Table A12.3).

**Table A12.3: Poverty Incidence in Project Area**  
(%)

Year	Project County			Hunan Province
	Dingcheng	Taoyuan	Yuanling	
2004	11.5	11.6	21.6	12.4
2005	9.7	10.1	21.0	10.7
2006	7.6	8.0	20.2	9.0
2007	9.4	7.8	18.4	8.6
2008	7.4	7.6	17.6	8.2
2009	6.5	6.9	16.2	6.7
2010	5.6	6.5	15.3	6.5

Source: Hunan University.

#### **D. Labor and Employment**

8. According to the second socioeconomic monitoring report prepared by Hunan University in April 2008, around 4,643 local laborers were directly employed in expressway construction along the alignment, mostly in Yuanling county. In addition, locally procured construction materials and supplies—including 111,000 tons of steel, 940,000 tons of cement, 23,000 cubic meters (m<sup>3</sup>) of timber, 14.8 million m<sup>3</sup> of sand and stone, and 220,000 tons of gasoline and diesel—also provided a large number of employment opportunities in the project area. A total of 6,150 local laborers worked for the materials and supplies for the expressway construction (Table A12.4). In addition, 320 people were recruited to work for toll services, and 44 local people were engaged in cleaning and maintenance, most of them from poor families in surrounding areas.

**Table A12.4: Local Employment Opportunities by Expressway Construction**  
(Persons)

<b>Project Area</b>	<b>Local Laborers Employed in Expressway Construction</b>	<b>Indirect Employment for Supplies and Materials</b>
Dingcheng	648	576
Taoyuan	670	562
Yuanling	3,325	5,012
<b>Total</b>	<b>4,643</b>	<b>6,150</b>

Source: Second socioeconomic monitoring report. Hunan University. April 2008.

## **E. Awareness and Prevention of HIV/AIDS**

9. According to the CECC, 7,000 HIV/AIDS prevention posters were placed in September 2005 and March 2006 in a joint effort between the CECC and contractors to improve awareness of HIV/AIDS prevention for local people with the assistance from local disease control centers. In addition, prevention education documented in films and videos were also organized, and many clinics were opened in communities along the expressway.

## **F. Gender Development**

10. The operation of the expressway and improved local roads has promoted gender development in the project area. Improved road conditions have enabled local women to get access to medical services, particularly those women who live in remote mountainous areas. It has been observed in recent years that more pregnant women have delivered their babies in hospitals, and hospital delivery reached more than 99% in the project area. In addition, the improvement of transport conditions has promoted career development for local women, particularly their engagement in local tourism.

## **G. Ethnic Minority Development**

11. The project is located in ethnic minority areas, particularly in Yuanling county, which has 367,400 minority people including Miao, Tujia, Bai, and 24 other minority groups, accounting for 56.5% of the total population. During project preparation, an ethnic minority development plan was prepared to ensure that adverse project impacts on minorities could be mitigated and local communities provided with benefits in a culturally appropriate manner. Hunan University was recruited as the monitoring agency to monitor implementation of the ethnic minority development plan and social action plan. The implementation status is presented in Table A12.5.



**Table A12.5: Implementation Status of Ethnic Minority Development Plan and Social Action Plan**

<b>Proposed Actions</b>	<b>Targets</b>	<b>Agencies Involved</b>	<b>Timing</b>	<b>Funding Requirements</b>	<b>Implementation Status</b>
Improved transport services: (i) local roads component; (ii) enhanced competition amongst service providers; and (iii) credit for vehicle purchase.	Rural poor households in 28 townships. More than 50% of the population to be served are from ethnic minorities and vulnerable households in remote mountainous areas	Implementation agency, local government, TAB	2004–2008	Project and local government  May require additional collaboration with other government agencies	Nine local roads were constructed or improved under the project. The competition amongst service providers was enhanced and led to a deferred increase in ticket prices; e.g., the ticket price from Yuanling to Guangzhuan increased slightly from CNY15 in 2003 to CNY18 in 2008, and the price from Yuanling to Huanhua City only increased from CNY25 in 2003 to CNY31 in 2008. The travel cost was actually reduced with exclusion of inflation.
Construction of local roads: (i) links with local development initiatives.	County and township governments, and communities along the roads	IA, local government, TAB	2004–2006	Integrated in project design	A total of CNY676 million was invested in local road construction, accomplished improvement of 510 km of local roads  More than 20 meetings were organized by local governments and communities to discuss local roads construction
Protection of ethnic minority communities from construction disturbances: (i) prohibiting night-time construction; (ii) building pedestrian crossings, over- and underpasses, and culverts; and (iii) reconstructing damaged irrigation and drainage systems.	Over 100,000 population  Over 100 villages, including 97 villages affected by land acquisition and resettlement	IA and contractors	2004–2006	Covered by EIA	In addition to construction of 433 pedestrian crossings, 285 culverts, and 9 overpasses in original design, 5 crossings and 24 culverts were constructed as requested by local communities. The design of crossings and culverts was modified many times to meet requirements from local communities. The damaged irrigation and drainage systems were rehabilitated during resettlement implementation. In addition, soil erosion control measures were taken to protect ancient minority villages.
Awareness and prevention of HIV/AIDS at local health clinics near construction camps, and for local communities: (i) health clinics near construction camps; (ii) HIV and STD prevention posters; and (iii) HIV and STD education program through popular media channels and through clinics.	In all construction camps and nearby villages  Women (e.g., sex workers) found to be at higher risk of infection	IA, contractors and local public health agency, ethnic affairs bureau, ACWF	2004–2006	Included in EIA, covered by contractors	A total of 7,000 HIV/AIDS prevention posters were placed in construction sites and nearby local communities in September 2005 and March 2006 with assistance from the local CDCs. In addition, prevention education via films and videos was also organized for construction workers and local communities, and many clinics have been opened along the alignment.

<b>Proposed Actions</b>	<b>Targets</b>	<b>Agencies Involved</b>	<b>Timing</b>	<b>Funding Requirements</b>	<b>Implementation Status</b>
Awareness on cultural relics protection  Preliminary surveys to determine the presence of potential cultural relic sites	Construction workers and local residents	IA, contractors, cultural relic authorities	2003–2006	Covered by EIA	A total of 100 posters and 2,000 handbills were disseminated in project area to promote awareness of cultural relic protection. EIA measures were taken by CECC and local cultural relic authorities.
Income recovery for resettlement-affected people: (i) receive support by local government and village cadres when assistance is requested; and (ii) be given priority for training, adult education, and construction employment opportunities	Resettlement-affected people, especially for 10 seriously affected villages, of which 8 villages have a majority of ethnic minorities	IA, local labor and social security bureaus, ACWF, agricultural sector, Ethnic Affairs Bureau	2003–2006	CNY120 million covered by resettlement plan	Special measures in resettlement plan were taken to support resettlement-affected minorities during land acquisition and resettlement implementation. A total of 3,000 male and 4,000 female minority laborers received skills training.
Farmland reclamation.	Ethnic minority villages (not necessarily the ones that lose land); about 15,885 people to benefit	IA, Hunan Land and Resources Bureau, Ethnic Affairs Bureau	2005–2006	CNY105.9 million land development will be financed by the tax paid for the loss of cultivated land	A total of 4,792 <i>mu</i> <sup>a</sup> of farmlands were reclaimed, benefiting 19,200 local people, including 16,000 minority people
Afforestation	Ethnic minority villages; about 18,000 people to benefit	IA, Hunan Forestry Bureau, Ethnic Affairs Bureau	2005–2006	CNY6.0 million land development will be financed by about 70% of the tax paid for the loss of orchard and economic trees, timber forest, and bush land	A total of CNY112 million was invested in forestation of 124,788 <i>mu</i> in Yuanling county from 2004 to 2007. A total of 650,000 people benefit from the forestation, and over 70% of the beneficiaries are from minority groups.
Preference given to ethnic minority people for unskilled construction work, including equal opportunity for work and pay for women	About 33% of afforestation work for ethnic minority women  About 33% of unskilled contract work will be for ethnic minority people (half for women)	IA, contractors, and ADB	2004–2006	Included in project cost, included in contract documents	Around 800 laborers from vulnerable families were recruited as unskilled construction laborers. A total of 500 female laborers worked for the project and received equal pay.

<b>Proposed Actions</b>	<b>Targets</b>	<b>Agencies Involved</b>	<b>Timing</b>	<b>Funding Requirements</b>	<b>Implementation Status</b>
Road and traffic safety: (i) road safety education program, especially for ethnic minority communities along the local roads; (ii) speed limited signboards on G319 at sections crossing rural towns and villages; and (iii) strict implementation of traffic regulations on G319	Ethnic minority groups residing in communities along G319 and local roads  Drivers on G319 and local roads	IA, local public security bureau, and local transport bureau	2004–2008	Integrated into project design	Local traffic police departments enhanced road and traffic safety for G319, including 266 traffic signs, 3,078 meters of wave-shape guardrail, 81 warning boards, and 9,758 meters of protection facilities. However, the traffic safety of township and village roads still needs to be improved. In addition, local traffic police departments took measures to promote awareness of road and traffic safety, including dissemination of booklets, notice banners, as well as delivery of lectures in middle and preliminary schools along the alignment.
Enhancement of poverty reduction interventions at local road sections: (i) increased access to micro credit for increased vehicle ownership; (ii) technical training on fruit production; and (iii) distribution of market information	Micro credit: 50% to ethnic minority households, with about 20% targeted at female borrowers	ABC, RCC, Poverty Reduction Office, county and township government	2004–2008	Additional collaboration between Poverty Reduction Office and RCC/ABC is required	A total of 11,000 person-times trainings on agricultural technologies were organized by local governments, in which 60% of trainees were women. Micro credit was conducted by local ABCs (no detailed information provided).
Tourism development and promotion: (i) announcement of opening of local road sections on tourism websites; (ii) construction of tourism infrastructure; and (iii) promotion of tourism resources	Counties within project area  Tourists and tourism agents	Local government and tourism bureaus	2005 onward	Additional collaboration among the government, tourism sector, and provincial Ethnic Affairs Bureau is required	Seven large tourism advertisement boards were set up along the expressway alignment. Local tourism promotion was also advertised through Hunan Television, newspapers, and tourism websites. A total of 100,000 sets of tourism handbooks were disseminated. In addition, the Yuanling county government invited the media and travel agencies to visit local scenic spots and attend tourism seminars, and established the Eryoutang website to attract external travelers and promote local tourism development through the internet.

ABC = Agricultural Bank of China, ACWF = All China Women's Federation, ADB = Asian Development Bank, CDC = Centers for Disease Control, CECC=Changji Expressway Construction and Development Company, EIA = environmental impact assessment, G319 = national road 319, RCC = Rural Credit Corporation, STD = sexually transmitted disease, TAB = Transport Administration Bureau.

Note: A *mu* is a Chinese unit of measurement (1 *mu* = 666.67 square meters).

Sources: Hunan Provincial Transportation Department and Changji Expressway Construction and Development Company.

## ENVIRONMENTAL IMPACT ANALYSIS

### A. Introduction

1. Under the Hunan Roads Development II Project, a 173-kilometer (km) four-lane access-controlled expressway was constructed from Changde to Huaihua, including tunnels, bridges, interchanges, toll stations, and service areas. Under the project 518 km of local roads in five counties were also upgraded.

2. The project was classified as Asian Development Bank (ADB) environment category A. The summary environmental impact assessment (SEIA) report was prepared based on the domestic environment impact assessment (EIA) and soil erosion protection plan (SEPP) in March 2004. The SEIA elaborated the environment management plan (EMP) to implement the mitigation measures and the monitoring program. The SEIA concluded that the project would reduce motor vehicle emissions as a result of improved motor vehicle engine efficiency when operating on the expressway, lessen dust levels through paving of local roads, and improve environmental technical skills at the operational levels. Potential adverse environmental impacts would be avoided or reduced to acceptable levels through appropriate mitigation and compensation measures.

3. The EIA report was approved by the State Environmental Protection Administration in December 2003. The SEPP was approved by the Ministry of Water Resources in April 2004. The completion technical review for environment protection was undertaken by the Environment Protection Center of the Ministry of Communication in July 2009. Government approval of completion acceptance for environment protection was obtained in July 2010. The ADB project completion review mission was conducted in November 2011.

### B. Environmental Protection and Management

4. During construction, the environment management office established under the Hunan Provincial Transportation Department (HPTD) coordinated the environment management for the project. The environment and resettlement unit under the Hunan Expressway Construction and Development Company oversaw the project EMP implementation. The supervision companies engaged by the Changji Expressway Construction and Development Company (CECC) supervised and inspected implementation of the onsite mitigation measures.

5. During operation, environmental management mainly involves the maintenance of slope protection works and landscape vegetation, wastewater and solid-waste treatment from service areas, and environmental monitoring. These tasks are coordinated by the environment and resettlement unit under the Hunan Expressway Construction and Development Company and supervised by the environmental management office of the HPTD. As per the SEIA, the CECC has formulated an environment monitoring program for the expressway operation and has allocated an annual budget of CNY100,000 for monitoring activities during the expressway operation period. Mitigation measures have been undertaken as necessary to remediate the adverse environment impacts according to the monitoring results.

6. At appraisal, it was estimated that the total cost of environmental protection and mitigation measures would be about CNY116.8 million, exclusive of engineering costs for erosion control. According to the CECC's completion report, the actual total investment for environmental protection was CNY145.8 million. The EMP budget was spent as planned. Additional environmental mitigation and monitoring activities for small scale slope stabilization, soil erosion control,

and vegetation cover protection were identified and adequately implemented during project implementation.

### **C. Environmental Monitoring**

7. The environmental monitoring was conducted adequately according to the monitoring program as stipulated in the SEIA. Environmental monitoring was undertaken at two levels: daily environmental monitoring by contractors and construction supervision companies, and periodic environmental monitoring by environmental experts, who took samples for analysis in accordance with relevant environment standards and technical codes.

8. During construction, the Hunan Provincial Highway Design Institute was engaged to periodically monitor the project construction impacts on water, air, noise, and ecological environment. The Huaihua Municipal Environment Monitoring Station monitored the environmental impacts for the rural roads development component. The Hunan Provincial Soil and Water Conservation Monitoring Station monitored soil erosion and conservation effectiveness. Seventeen environment monitoring reports were prepared, based on which four consolidated monitoring reports were submitted to ADB, two of which were posted on the ADB website. The monitoring results showed that no significant environmental damage occurred during construction.

### **D. Environmental Impacts and Mitigation Measures**

#### **1. Land Resources and Solid Wastes**

9. During construction, the project permanently acquired 1,307.5 hectare (ha) of land, 185.5 ha more than the appraisal estimate. About 328 ha of land was occupied temporarily for borrow pits, disposal sites, concrete mixing stations, and cement aggregate and concrete batch plants. Under the project, 18 borrow pits and 59 disposal sites were constructed. The borrow pits and disposal sites were carefully selected to minimize the number of sites, thus minimizing land disturbance. All borrow pits and spoil sites have been restored and rehabilitated according to the SEPP through retaining structures, drainage systems, and vegetative measures. Six concrete mixing stations have been rehabilitated and revegetated effectively.

10. During operation, the solid wastes are mainly from domestic operations of toll and service stations. All stations have been fitted with garbage collection facilities. All solid wastes are collected and transported by maintenance and service staff according to national and local regulations.

#### **2. Surface and Ground Water**

11. During construction, the adverse impacts on water quality were limited and were mainly from siltation and wastes from construction sites and workers' camps. All proposed mitigation measures were undertaken appropriately. The monitoring results showed that the water quality of the Yuanshui and Wushui rivers was well maintained within the targeted standards (grade III, GB3838–2002).

12. Operating impacts on water quality include limited pollution of domestic wastewater from toll and service stations and from periodic storm water runoff from road surfaces. Wastewater treatment facilities have been constructed according to EIA requirements. Domestic wastewater is discharged after treatment and meeting the discharge standards. Road surface runoff is

diverted through drainage systems and is discharged after treatment. Initial monitoring showed that the discharged water from domestic facilities met grade I standard for wastewater discharge of GB8978–1996. An emergency response system has been established to mitigate risks from hazardous materials transportation, which include institutional set up, staff assignment, working mechanism, and communication and reporting arrangements.

### **3. Noise**

13. According to the final engineering design, seven noise-sensitive sites were identified. During construction, noise impacts were mainly from construction machinery and transportation vehicles. Mitigation measures were undertaken to minimize and/or avoid noise impacts as described in the EMP. The monitoring results showed that noise levels from construction were well controlled in terms of national noise standards for construction sites (GB12523–90). Considering the potential noise impacts during operation, noise barriers were installed at 21 sensitive sections with a total length of 3,657 meters. According to the monitoring results, the existing noise levels are well controlled within grade II of the national ambient noise standard (GB3096–2008).

### **4. Ambient Air Quality**

14. During construction, the major air pollution was from dust due to cement mixing and transportation. Mitigation measures were fully implemented as required in the EMP, which included water spraying, covering of transported materials, and good machinery maintenance. During operation, the negative impacts on air quality are very minor and limited to vehicle emissions. The monitoring results for vehicle emissions show that the level of nitrogen dioxide is below the grade II limits of the national ambient air quality standards (GB3095–1996).

## **E. Public Consultation**

15. Public consultation was undertaken through questionnaires and interviews. Consultation with 110 drivers and passengers showed that 83.6% of interviewees were satisfied and 16.4% were generally satisfied with the environmental management measures undertaken. Consultation with 150 residents along the alignment showed that 72.7% of interviewees were satisfied and 27.3% were generally satisfied with the environmental management measures. The results showed that 40% of interviewees consider noise as the major impact during operation.

## **F. Conclusions**

16. During construction, all contractors fulfilled their obligation to protect the environment and to implement mitigation measures in their construction schemes. The CECC implemented the project EMP effectively. The adverse effects associated with project construction on the surrounding environment were thus minimized. No rare natural resources or cultural relics were affected as a result of the project. During operation, the impacts on the ambient environment are minor and within the SEIA scope. There have been certain environmental benefits from reducing motor vehicle emissions as a result of improved motor vehicle engine efficiency when operating on the expressway and from lessening the dust levels on rural roads.