



# Completion Report

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Project Number: 37494  
Loan Number: 2219  
September 2014

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

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Asian Development Bank

## CURRENCY EQUIVALENTS

Currency unit – yuan (CNY)

		<b>At Appraisal</b> (15 June 2005)	<b>At Project Completion</b> (31 Dec 2012)
CNY1.00	=	\$0.1210	\$0.1587
\$1.00	=	CNY8.2700	CNY6.3026

## ABBREVIATIONS

ADB	–	Asian Development Bank
EIRR	–	economic internal rate of return
EMDP	–	ethnic minority development plan
EMP	–	environmental management plan
FIRR	–	financial internal rate of return
GDP	–	gross domestic product
HPTD	–	Hunan provincial transportation department
ICB	–	international competitive bidding
JECC	–	Hunan Jicha Expressway Construction and Development Co.
O&M	–	operation and maintenance
PRC	–	People’s Republic of China
SEIA	–	summary environmental impact assessment
TA	–	technical assistance

## WEIGHTS AND MEASURES

ha	–	hectare
km	–	kilometer
m <sup>2</sup>	–	square meter
m <sup>3</sup>	–	cubic meter
mu	–	Chinese unit of measurement (1 mu = 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	2219
3.	Project Title	Hunan Roads Development III Project
4.	Borrower	People's Republic of China
5.	Executing Agency	Hunan Provincial Transport Department
6.	Amount of Loan	\$208.00 million
7.	Project Completion Report Number	PRC 1472

### B. Loan Data

1.	Appraisal			
	– Date Started	15 June 2005		
	– Date Completed	20 June 2005		
2.	Loan Negotiations			
	– Date Started	14 November 2005		
	– Date Completed	15 November 2005		
3.	Date of Board Approval	15 December 2005		
4.	Date of Loan Agreement	15 November 2006		
5.	Date of Loan Effectiveness			
	– In Loan Agreement	13 February 2007		
	– Actual	02 February 2007		
	– Number of Extensions	0		
6.	Closing Date			
	– In Loan Agreement	30 June 2012		
	– Actual	31 December 2012		
	– Number of Extensions	1		
7.	Terms of Loan			
	– Interest Rate	ADB's London interbank offered rate (LIBOR)		
	– Maturity	25 years		
	– Grace Period	5 years		
8.	Terms of Relending			
	– Interest Rate	ADB's London interbank offered rate (LIBOR)		
	– 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>
		8 August 2008	7 December 2012	52 months
		<b>Effective Date</b>	<b>Original Closing Date</b>	<b>Time Interval</b>
		2 February 2007	30 June 2012	65 months

## b. Amount (\$ million)

Category or Subloan	Original Allocation	Last		Amount Disbursed	Undisbursed Balance
		Revised Allocation	Amount Canceled		
Civil works, expressway	156.24	183.39	0.00	183.39	0.00
Civil works, local roads	8.00	8.00	0.00	8.00	0.00
Equipment	7.64	0.22	7.42	0.19	0.03
Consulting services and training	1.51	1.11	0.00	1.11	0.00
Interest and commitment charges	22.16	7.86	0.00	7.86	0.00
Unallocated	12.45	0.00	0.00	0.00	0.00
<b>Total</b>	<b>208.00</b>	<b>200.58</b>	<b>7.42</b>	<b>200.55</b>	<b>0.03<sup>a</sup></b>

<sup>a</sup> The undisbursed \$0.03 million was canceled at loan closing on 20 June 2013.

10. Local Costs (Asian Development Bank financed): 0.00

## C. Project Data

## 1. Project Cost (\$ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	263.98	200.55
Local Currency Cost	255.53	697.54
<b>Total</b>	<b>519.51</b>	<b>898.09</b>

## 2. Financing Plan (\$ million)

Cost	Appraisal Estimate			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
Implementation Costs						
Borrower-financed	55.98	236.37	292.35	0.00	651.31	651.31
ADB-financed	185.84	0.00	185.84	192.69	0.00	192.69
<b>Subtotal</b>	<b>241.82</b>	<b>236.37</b>	<b>478.19</b>	<b>192.69</b>	<b>651.31</b>	<b>844.00</b>
IDC Costs						
Borrower-financed	0.00	19.16	19.16	0.00	46.23	46.23
ADB-financed	22.16	0.00	22.16	7.86	0.00	7.86
<b>Subtotal</b>	<b>22.16</b>	<b>19.16</b>	<b>41.32</b>	<b>7.86</b>	<b>46.23</b>	<b>54.09</b>
<b>Total</b>	<b>263.98</b>	<b>255.53</b>	<b>519.51</b>	<b>200.55</b>	<b>697.54</b>	<b>898.09</b>

ADB = Asian Development Bank, IDC = interest during construction.

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

Component	Appraisal Estimate			Actual			
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost	
<b>A. Base Cost</b>							
1. Expressway civil works		207.44	118.06	325.50	183.39	492.46	675.85
2. Equipment		7.64	10.07	17.71	0.19	15.50	15.69
3. Land acquisition and resettlement		0.00	31.96	31.96	0.00	58.80	58.80
4. Consulting services and training		1.51	4.78	6.29	1.11	7.96	9.06
5. Local roads		12.41	8.28	20.69	8.00	46.93	54.93
6. Project administration		0.37	20.95	21.32	0.00	29.66	29.66
7. Tax and duties		0.00	9.88	9.88	0.00	0.00	0.00
<b>Subtotal (A)</b>		<b>229.37</b>	<b>203.98</b>	<b>433.35</b>	<b>192.69</b>	<b>651.31</b>	<b>844.00</b>

Component	Appraisal Estimate			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
<b>B. Contingencies</b>						
1. Physical contingencies	12.45	12.35	24.80	0.00	0.00	0.00
2. Price contingencies	0.00	20.04	20.04	0.00	0.00	0.00
<b>Subtotal (B)</b>	<b>12.45</b>	<b>32.39</b>	<b>44.84</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>C. Interest and Commitment Charges during Construction</b>	<b>22.16</b>	<b>19.16</b>	<b>41.32</b>	<b>7.86</b>	<b>46.23</b>	<b>54.09</b>
<b>Total</b>	<b>263.98</b>	<b>255.53</b>	<b>519.51</b>	<b>200.55</b>	<b>697.54</b>	<b>898.09</b>

## 4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	November 2006	July 2007
Completion of Detailed Designs	December 2005	December 2005
Civil Works Contract		
Date of award	December 2006	August 2007
Completion of work	December 2011	January 2012
Equipment and Supplies		
First procurement	October 2007	February 2009
Last procurement	July 2009	June 2011
Completion of equipment installation	September 2011	December 2011
Start of Operations		
Completion of tests and commissioning	December 2011	March 2012
Beginning of start-up	December 2011	March 2012

## 5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 15 to 31 December 2005	Satisfactory	Satisfactory
From 1 January 2005 to 31 May 2006	Satisfactory	Satisfactory
From 1 June 2006 to 1 January 2007	Satisfactory	Unsatisfactory <sup>a</sup>
From 1 February 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	Satisfactory
From 1 January 2011 to 31 December 2011	Satisfactory	Satisfactory
From 1 January 2012 to 31 December 2012	Satisfactory	Satisfactory

<sup>a</sup> Four months delay in signing the loan agreement.

## D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members
Fact-finding	20–26 Apr 2005	7	49	a, b, c, f
Appraisal	15–20 Jun 2005	5	30	a, b, c, e
Inception	12–15 Dec 2006	1	4	a
Review 1 and hand over <sup>a</sup>	13–16 Nov 2007	4	16	a, f, g
Review 2	28 Oct–3 Nov 2008	3	26	a, g, i
Midterm review	14–23 Oct 2009	5	31	d, g, h, i, l
Review 4	12–17 Apr 2010	4	24	g, i, j, l
Review 5	7–14 Apr 2011	5	31	a, d, g, l, m
Review 6	7–14 May 2012	2	16	a, g

<b>Name of Mission</b>	<b>Date</b>	<b>No. of Persons</b>	<b>No. of Person-Days</b>	<b>Specialization of Members</b>
Project completion review <sup>b</sup>	2–9 Sep 2013	6	39	a, d, g, i, j, k

<sup>a</sup> The Hunan Roads Development III Project was transferred to the Asian Development Bank Resident Mission in the People's Republic of China for administration on 27 December 2007.

Note: a = engineer, b = financial specialist, c = economist, d = environment officer, e = counsel, f = resettlement specialist, g = project analyst, h = staff consultant, i = resettlement officer, j = finance officer, k = social development officer, l = procurement officer, m = disbursement officer.

## I. PROJECT DESCRIPTION

1. With rapid economic growth in the People's Republic of China (PRC) since the 1980s, vehicle ownership and demand for road transport infrastructure have increased substantially. Fast growth and structural change in the economy and efforts to reduce economic imbalances between the coastal provinces and the inland regions have resulted in a shift in the factors of production from the coastal regions to the interior. Labor-intensive industries are relocating inland, generating strong demand for least-cost and direct flow of freight and traffic between regions. In 2000, the volume of road freight transport in the PRC was 597.3 billion ton-kilometers (ton-km) and passenger transport 660.0 billion passenger-kilometers (passenger-km). By 2012, road freight transport had increased to 5,999.2 billion ton-km and passenger transport to 1, 846.7 billion passenger-km. Since 2009, the PRC has replaced the United States as the world's largest automotive market: 13.6 million vehicles were sold in 2009, 18.5 million in 2011, and 19.3 million in 2012. To cope with the fast-growing number of vehicles in urban and rural areas, increasing traffic pressure on the road network, rising demand for better roads, and anticipated improved transport services, in 1988 the government embarked on a long-term strategy of creating a national trunk highway system of 35,000 kilometers (km). By 2004, this strategy had evolved into a plan for an 85,000 km national expressway network for completion by 2020; it was achieved much earlier than planned with a total length of 85,000 km of national expressway by 2011 and 96,000 by 2012. In 2013, the government issued a national road network plan to bring the length of national nontoll roads to 265,000 km and that of low-toll expressways to 118,000 km by 2030. All economic centers and municipalities would then be connected by expressways and by a supplementary nationwide network of local roads.

2. The Asian Development Bank (ADB) has supported government efforts to expand and improve national and local road networks since 1991. 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 2012, the PRC road network totaled 4,237,500 km: 96,200 km of expressways, 74,300 km of class I roads, 331,500 km of class II roads, 401,900 km of class III roads, 2,705,800 km of class IV roads, and 627,900 km of underclass roads.<sup>1</sup> However, the PRC's road network density of 41.75 km per 100 square kilometers is only about half that of the United States and one-eighth that of Japan. The government's road policy, as reflected in its 12th Five-Year Plan for 2011–2015, involves (i) expanding the road network, improving road quality and technical standards, and increasing the total length of the country's highways to 4.5 million km; (ii) increasing the total length of expressways to 108,000 km and connecting 90% of the cities with at least 200,000 residents to the national expressway network; (iii) increasing the total length of class II roads and higher technical standards to 650,000 km; and (iv) achieving a total road length of 3.9 million km in rural areas.

3. As a landlocked province in the interior of the PRC, Hunan province was one of the relatively poor provinces in 2000 in terms of gross domestic product (GDP) per capita. However, with 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 CNY33,587 in 2012 (86%). Hunan 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

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<sup>1</sup> PRC road standards include expressways and four classes of roads. Expressways are multilane, high-speed national highways. Class I roads are multilane national and provincial highways. Class II roads are two-lane main roads. Class III roads are two-lane roads, mostly used for local connections. Class IV roads are two-lane or single-lane feeder roads.



major highway corridors and railway lines have been built since the 1990s, linking with the northern, southern, and eastern neighboring provinces. In addition, an inland waterway transportation initiative was launched to improve waterway navigation conditions.<sup>2</sup> However, up until the early 2000s, the sole major road linking the western part of Hunan to the PRC's western regions had deteriorated, constraining interprovincial traffic movement and hindering 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, combined class III and IV technical standards. The two-lane national highway had a total width of 7–9 meters, and was frequently congested.

4. In the early 2000s, the government determined that an improved transport corridor passing through the western part of Hunan province connecting developed areas and economic centers was a priority. Two of the reasons for the high poverty incidence were the geographic isolation and high cost of motorized transportation. Many farmers in the poorer mountainous villages did not have adequate access to markets and experienced limited mobility beyond their immediate communities. Inadequate road access was also an impediment to higher agricultural productivity and prevented access to job opportunities in the towns. Better transport links were needed to improve economic efficiency, promote domestic and international trade, and contribute to poverty reduction.

5. The principal objectives of the project were to promote sustainable economic growth and reduce poverty in Hunan province as a whole and the project area in particular. The project, as designed, would (i) enhance road transport efficiency and safety; (ii) improve the road transport network by building a section from Jishou to Chadong in the Changsha–Chongqing western corridor,<sup>3</sup> and (iii) improve the access of rural minority communities to income-generating opportunities and social services. The project framework is in Appendix 1.

6. The Hunan provincial communications department prepared the project feasibility study in 2000.<sup>4</sup> ADB approved project preparatory technical assistance (TA) on 2 September 2004 to review and assess the project's technical feasibility and financial viability, including its environmental and resettlement impact. The TA was completed in April 2005, 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 mission verified compliance with ADB's country operational strategy and sector policy.<sup>5</sup> The government approved the study in October 2005. ADB's Board of Directors approved a loan of \$208.0 million on 15 December 2005. The loan took effect on 2 February 2007 and was scheduled to close on 30 June 2012, but the closing date was extended to 31 December 2012 to allow for completion of the local roads. The loan account was closed on 20 June 2013. Appendix 2 provides a chronology of major events.

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<sup>2</sup> On 7 Dec 2012, ADB approved Loan 2962: Hunan Xiangjiang Inland Waterway Transport Project.

<sup>3</sup> One of eight high-priority western corridors.

<sup>4</sup> The Hunan provincial communications department was renamed the Hunan provincial transportation department on 1 June 2009.

<sup>5</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.

## II. EVALUATION OF DESIGN AND IMPLEMENTATION

### A. Relevance of Design and Formulation

7. ADB's country strategy for roads in the PRC at the time of appraisal supported (i) the construction of roads connecting major coastal growth centers with the interior regions; (ii) the integration of the road network so that the national trunk highway system would be supported by a system of local roads, in particular roads providing access to poor areas; (iii) the promotion of road safety; (iv) institutional strengthening to increase the financial and managerial efficiency of expressway operations; (v) the adoption of appropriate pricing policies to optimize road transport capacity; and (vi) the use of alternative methods of investment financing. The strategy was intended to foster the economic development of the western region and minimize development gaps between the inland and coastal provinces. Roads therefore are an important part of the strategy for strengthening economic links between the two regions.

8. The project was designed to support the government's development strategy for the western region by providing a link in the vital Changsha–Chongqing corridor, one of the eight prioritized western development corridors included in the 10th Five-Year Plan (2001–2005) and the 11th Five-Year Plan (2006–2010). The project was consistent with ADB's country operational strategy as it supplied a 64 km expressway from Jishou to Chadong in the Changsha–Chongqing corridor. The expressway would reduce the journey time from 3.5 hours to 1 hour, thus offering a considerably faster and safer alternative. By lowering transport costs, enhancing the frequency and quality of transport services, and improving access to mountainous ethnic minority regions, the project was expected to spur economic activity and interregional trade, and reduce poverty in the project area.

### B. Project Outputs

9. At appraisal the project outputs included (i) the construction of a 64 km, access-controlled toll expressway from Jishou to Chadong, including a large suspension bridge (1.2 km), 13 tunnels (10.5 km in total), 36 extra-large or large bridges (18 km in total), interchanges, toll stations, and service areas; (ii) the upgrading of 129 km of local roads to improve access to 52 poor villages in the rural minority area; (iii) the promotion of private sector participation through the operation and maintenance (O&M) concession; and (iv) the provision of consulting services and training to strengthen the capacity of the Hunan provincial government for construction, road safety, project monitoring and evaluation, and asset management and maintenance. All the outputs were achieved, except for the promotion of private sector participation because the required financial ratio was not reached as of September 2013.

#### 1. Expressway

10. Civil works for the project expressway comprised (i) 16 subgrade packages procured through international competitive bidding (ICB) and one subgrade package through national competitive bidding (NCB); (ii) three pavement packages procured through ICB; (iii) two toll collection, telecommunication, and surveillance system packages procured through ICB and one maintenance package through shopping; and (iv) 17 packages for traffic engineering, greening and planting, and buildings and ancillary facilities procured through NCB. Contracts for the 17 subgrade packages were awarded in September 2007 and the three pavement packages in January 2011. All subgrade packages except for the Aizhai suspension bridge were completed in January 2011 and pavement packages were completed in December 2011. The Aizhai suspension bridge package was completed in January 2012. Traffic engineering,

greening and planting, buildings and ancillary facilities were implemented simultaneously to match the implementation schedule of subgrade and pavement works. Construction of buildings and ancillary facilities—including the project management building, traffic monitoring centers, two service areas, four toll stations, one maintenance center, and one tunnel administration station—funded through domestic sources started in January 2011 and were completed in December 2011. Planting and greening activities were completed in February 2012. The project expressway was opened to traffic on 31 March 2012.

11. The expressway includes four interchanges, 12 overpasses, 91 underpasses, 57 culverts, 41 large and super-large span bridges, and 21 medium-span bridges, all of which meet prescribed national and international standards. During project implementation, the Jicha Expressway Construction and Development Company (JECC) conducted 10 technical studies in the field, such as construction safety management based on different risks. The outputs of several studies were shared with other project expressways in Hunan province. Among these studies, one received provincial recognition for technical achievement and others have applied for other national and/or provincial recognition credits.

## **2. Local Roads**

12. The local road improvement program comprised two roads with a total length of 129 km. The Xiangxi Autonomous Prefecture Transportation Bureau established four companies to implement the local road improvement program. However, the upgrading and improvement of the local roads was 1 year behind schedule due to complex domestic approval procedures. In 2005, the Hunan provincial government approved the feasibility studies for these two local road projects. Procurement for civil works started in June 2007 and construction commenced in September 2009. In December 2012, the civil works for both roads was complete and the roads were opened to traffic.

13. Four civil works contracts were required for the Guzhang–Baojing local road, which was designed with a subgrade width of 7.5 meters, a carriageway width of 6.5 meters, and design speed of 30 km/hour. After the contracts were awarded to contractors, the Hunan provincial transportation department (HPTD) sought a minor change to include the section under package A4 into another project as the connection road for the Zhangjiajie–Huayuan Expressway project, which is fully financed by domestic funds. The design standards were changed to increase design speed to 40 km/hour and expand the subgrade width to 12 meters within Baojing county. In May 2012, ADB approved the minor change of scope and HPTD assigned the Hunan Provincial Expressway Administration Bureau the responsibility for construction of the section under package A4, which is expected to be completed by the end of 2015.

## **3. Equipment**

14. At appraisal the three equipment packages, included (i) toll collection, surveillance, communications, tunnel lighting and ventilation systems; (ii) equipment for accident management; and (iii) maintenance equipment. Procurement of equipment for expressway management (E3), estimated at \$0.20 million, was completed in March 2009. Procurement of two contract packages for equipment for toll collection, communication, and traffic surveillance started in September 2010. However on 20 March 2012, ADB declared misprocurement resulting from violations of ADB's Procurement Guidelines and canceled loan proceeds of \$7,422,947.12. These misprocured packages were subsequently financed with domestic funds.

#### 4. Consulting Services and Training

15. **Consulting services.** One international consulting firm and six national consulting firms were engaged for construction supervision. The international consultant provided 47 person-months of consulting services, of which, 36 were for civil works supervision; 6 for bridge construction; 2 each for road safety and traffic management, and tunnel construction; and 1 for asset management. The planned inputs of the international consultant were (i) construction supervision, measurement, and disbursement; (ii) pavement design; (iii) tunnel construction; (iv) emission control and environment protection; (v) O&M concession; and (vi) socioeconomic impact monitoring and evaluation. The international consultant was mobilized on August 2007 and worked closely with JECC and the national consultants to ensure technology transfer and engineering quality, particularly in the fields of contract management, road safety, materials testing, and quality control. The international consultant services were concluded by November 2011 with cumulative inputs of 47 person-months.

16. Construction supervision was the responsibility of a supervision unit under JECC, headed by a chief supervising engineer. Four work groups working on the project site administered six supervision resident sections. Each civil works and pavement package had a resident engineer team comprising technical and administrative staff. Six national supervision firms were engaged through competitive selection following national procedures to provide supervision services, with cumulative inputs of 4,912 person-months, compared with 3,700 person-months envisaged at appraisal, for subgrade, pavement, buildings and ancillary works, and the toll and tunnel system. For environmental monitoring, JECC hired a domestic institute, Hunan Communications Environmental Protection Monitoring Center, in August 2007. In March 2007, it engaged Hunan University for the project performance management system, ethnic minority development monitoring, and resettlement monitoring. The national consultants provided the requested inputs and performed satisfactorily.

17. **Training.** At appraisal, a total 46.5 person months covering 10 topics and training groups were envisaged. At completion five groups of HPTD and JECC staff completed 41.0 person-months of out-of-country training on five topics, including (i) service area design, operation, and administration; (ii) test and application of new materials; (iii) drainage and slope protection; (iv) road rehabilitation; and (v) environment protection and landscaping. The out-of-country training groups submitted training reports to ADB as required, and reported gaining valuable practical knowledge. The knowledge acquired was disseminated within HPTD and JECC. In addition, JECC organized on-the-job training courses for 3,470 participants on subjects including construction supervision, quality control, contract management, construction safety, tunnel construction, and pavement design.

#### C. Project Cost

18. The project cost increased by 72.9%, from \$519.51 million to \$898.09 million. The cost revision included (i) cost adjustment at preliminary design and detailed design; (ii) price escalation for materials and labor; (iii) local road cost adjustment (165.5% increase); (v) increase in the cost for land acquisition and resettlement (84.0% increase); (vi) realignment of civil works package C16; and (vii) change in exchange rates, which if excluded would result in an actual project cost increase in yuan of 34.4%. The cost increase is also partly due to technical sustainability measures for tunnel and bridge works and engineering innovative solutions for the geographically difficult terrain.

19. The project financing plan was also adjusted. The Hunan provincial government counterpart fund contribution increased from \$94.58 million (18.2%) to \$221.38 million (24.7%). Counterpart funds from the Ministry of Transportation increased from \$59.74 million to \$76.80 million, reducing its financing percentage from 11.5% to 8.6%, while domestic bank loans increased from \$157.19 million to \$399.36 million increasing their share from 30.3% to 44.5%. The ADB loan was reduced from \$208.0 million to \$200.58 million due to the cancellation of \$7.43 million of the loan proceeds due to the misprocurement; ADB's financing percentage decreased from 40.0% to 22.3%. Appendix 3 presents the details of the project cost and the financing plan.

#### **D. Disbursements**

20. Of the \$200.58 million in loan proceeds after cancellation of \$7.43 million from the original loan amount of \$208.0 million, \$200.55 million was disbursed during 2008–2012. Three types of disbursement procedures were used: reimbursement for civil works, direct payment for consulting services, and commitments for equipment. Disbursement control procedures were satisfactory. Of the ADB loan proceeds disbursed, \$183.39 million went to civil works for the project expressway, \$0.19 million to equipment, \$1.11 million to training and consulting services, and \$8.00 million to local roads improvement; \$7.86 million was capitalized to cover interest during construction and the commitment charge. The loan closing date was extended from 30 June 2012 to 31 December 2012, and the loan account was closed on 20 June 2013, at which time loan savings of \$31,687.30 were canceled. Projected and actual contract awards and disbursements are set out in Appendix 4.

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

21. The project was to be implemented from October 2005 to December 2011. The local roads component was to be implemented at the same time as the expressway construction. The expressway construction began in September 2007, after a delay of about 10 months caused by lengthy domestic approvals and clarifications on bid evaluation reports. Effective measures were taken to secure the completion of the west section of the project expressway and its opening to traffic in March 2012. The two local roads were completed in December 2012. Heavy rainfall in the project area and constrained counterpart funds contributed to the delayed implementation of local roads, resulting in a 1-year extension for loan closing. The appraisal and actual project implementation schedules are in Appendix 5.

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

22. HPTD, the executing agency, was responsible for the overall administration of project implementation. Its foreign capital utilization office supervised and coordinated project implementation activities. JECC, a state-owned enterprise with independent legal identity established in March 2006, was the implementing agency for the project expressway component. At the time of the project, JECC had 111 implementation staff in 11 divisions and four resident engineering offices at the project sites. A supervision office, comprising an HPTD representative, the chief engineer, and international consultants, was created to provide construction supervision and quality control. The office had engineering, contract management, and supervision divisions, and a central laboratory. The Xiangxi Autonomous Prefecture Transportation Bureau implemented the local roads component under HPTD's overall guidance. JECC conducted on-the-job training and study tours, and participated in other training programs organized by HPTD.

23. When the project expressway's operating–profit ratio exceeds 10%, the Hunan provincial government will require HPTD to use its best efforts to award an O&M concession through a competitive bidding process equally open to all enterprises including private enterprises. As of the end of 2013, the project expressway's operating–profit ratio had not reached 10%. When the project expressway was opened to traffic in March 2012, JECC signed a franchise agreement with HPTD, authorizing the Hunan provincial expressway administration bureau to operate the project expressway and operate the toll collection function. The project organization charts are in Appendix 6.

## **G. Conditions and Covenants**

24. All covenants were relevant. No covenants were modified or waived during implementation. All current loan covenants due were complied with or were being complied with in December 2012. However, based on current financial analysis, the project company is not expected to be able to comply with the debt service coverage ratio covenant of not less than 1.2 starting from the 5th year of full operation of the project expressway. The Hunan provincial audit office audited the project accounts and financial statements and the audited reports were submitted on time. The reports were useful in identifying and addressing issues and weakness in project implementation. Compliance with the loan covenants is set out in Appendix 7.

## **H. Related Technical Assistance**

25. ADB provided project preparatory TA to help the government prepare an integrated roads development project to support pro-poor economic growth and reduce poverty in western Hunan province.<sup>6</sup> The TA was to primarily (i) refine the feasibility study, including the environmental impact assessment, summary environmental impact assessment, resettlement plan, and poverty impact analysis for the proposed project, in conformity with ADB 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 policy dialogue in areas such 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 was conducted from October 2004 to April 2005. Subsequent loan processing was based on the TA findings and recommendations.

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

26. An international consulting firm was recruited on 22 August 2005. The international consultants were fielded on 29 August 2007 and their services ended in November 2011. The national consultants for design, construction supervision, and procurement, financed by the government, were recruited on time, following national procedures acceptable to ADB.

27. ICB procedures were used to procure civil works for the expressway construction and NCB procedures for buildings and ancillary facilities and local roads with financing from the borrower. All 16 ICB subgrade contracts were awarded in 2007 and 2008; one ICB equipment package was awarded in 2009. On 20 March 2012, ADB declared misprocurement of the other two ICB equipment packages due to violations of ADB's Procurement Guidelines during procurement of these two packages. JECC hired a national procurement agent to assist in

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<sup>6</sup> TA 4384-PRC ADB. 2004. *Technical Assistance to the People's Republic of China for Preparing the Hunan Roads Development III Project*. Manila.

handling procurement-related activities. Relevant sections of ADB's Anticorruption Policy were incorporated in the bidding documents and contracts, and complied with. 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**

28. The international consultants engaged to assist in implementing the project performed satisfactorily and established good working relationships with both HPTD and JECC. They provided the required services in accordance with the terms of reference. The national consultants hired by JECC also provided satisfactory services during project implementation.

29. The civil works contractors performed well and completed the construction according to the schedule and as stipulated in their contracts. The domestic design institute designed the expressway, incorporating prevailing international practice. An innovative construction method was created and successfully applied for the Aizhai suspension bridge. The civil works for the expressway, comprising bridges and pavement, were well implemented and of satisfactory quality. O&M equipment was supplied, installed, and commissioned as scheduled. The environmental monitoring conducted by the national consultants during construction was satisfactory. Overall, the performance of the consultants, contractors, and suppliers was *satisfactory*.

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

30. HPTD implemented the project effectively and efficiently. Project management during the preparation and construction phases was efficient and effective. Expressway construction and maintenance conformed to international standards. A systematic project management system was put in place to ensure the effective use of funds. Domestic funds were mobilized on time. The submission of withdrawal applications was timely, and contractors were promptly paid. The land acquisition and resettlement activities were completed on time and to the satisfaction of affected people. However, misprocurement resulting from a violation of ADB's procurement procedure led to cancellation of \$7,422,947.12 of loan proceeds. Overall, the performance of the borrower and HPTD was *satisfactory*.

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

31. ADB conducted regular loan review missions during project implementation and provided effective advice to HPTD and JECC on project implementation, monitoring, and procurement matters. ADB reviewed and processed procurement documents efficiently. ADB processed the borrower's and HPTD's requests promptly. Withdrawal applications were processed and disbursed on time. HPTD and JECC expressed satisfaction with the transfer of project administration to ADB's PRC resident mission, which facilitated closer and more efficient communication. ADB performance during project implementation was assessed *satisfactory*.

### **III. EVALUATION OF PERFORMANCE**

#### **A. Relevance**

32. The project was *highly relevant*. It was relevant to the government's road development policy of expanding the national trunk highway system and developing secondary roads to help promote the rural economy and reduce poverty. The project is located in the western part of

Hunan province and serves as the area's main trunk transport corridor. The project was considered a priority project in the government's Western Region Development Strategy, as it connects the provincial capital Changsha with Chongqing and other economic centers in the western provinces. The project achieved its objectives (para. 5) by (i) decreasing road crashes in the project area by 20% and realizing vehicle operating cost savings of CNY0.30–CNY2.11 per vehicle-km for expressway traffic for different vehicle types; (ii) decreasing travel time between Jishou and Chadong from 3 hours to 1 hour; (iii) increasing transport capacity to 2,765 passenger car units (pcu) per hour; and (iv) improving 129 km of local roads and thereby helping to increase per capita annual net income of rural residents in the project area from CNY2,255 in 2007 to CNY5,260 in 2013, and reduce poverty incidence from 30% in 2005 to 15.5% in 2013.<sup>7</sup>

33. The project was consistent with ADB's strategy for PRC roads, at appraisal and at project completion (para. 8). The project was consistent with ADB's country partnership strategy for assistance in developing the Changsha–Chongqing section of the national trunk highway system.

## **B. Effectiveness in Achieving Outcome**

34. The project was *effective* in achieving its outcome. The outcome envisaged at appraisal—enhanced road transport efficiency and improved safety, completion of the Changsha–Chongqing western corridor, and improved access to income-generating opportunities and social services for the rural population in the project area—was substantially achieved. The expressway carried 45% of total corridor traffic when opened in 2012 and 59% in 2013 because of better transport conditions and the shorter distance. The annual average daily traffic on the project expressway was 4,286 pcu in 2012 which was lower than 6,000 projected at appraisal. However, during the first two years of expressway operation, the rate of increase for traffic volume was 39% which was higher than 20% projected at appraisal. The expressway allows safer, more efficient movement of passengers and freight at lower cost. In particular, the mountain road section in Aizhai along the parallel G319 (considered the most dangerous road in the PRC with its 18 switchbacks within 6 km for the elevation difference of 440 meters), which is replaced by the world longest suspension bridge crossing a valley along the expressway alignment. Traffic congestion and transport costs on the G319 have been reduced significantly as more vehicles now use the expressway. The annual average daily traffic on G319 decreased by 22% from 5,100 pcu in 2012 to 4,020 pcu in 2013. Vehicle operating cost savings per vehicle-km were CNY0.30–CNY2.11 for the expressway traffic for different vehicle types. Less congestion on the G319 resulted in vehicle operating cost savings of CNY0.15–CNY0.67 per vehicle-km for local roads. The bus fare was reduced by 40% and freight charges for rural transportation decreased by 33% in 2012 compared with the 2005 baseline. The number of serious road accidents and fatalities on the expressway was reduced by 22%, with 82 accidents and 1 fatality in 2013 compared with 101 accidents and 11 fatalities on the G319.

35. The improved local roads provided easier road access for people and goods thereby increasing income opportunities from cash-crop farming or seasonal work involving migration, increasing contact with urban centers, and improving access to markets and social services, which contributes to poverty reduction in the region. Bus service availability increased from 50% in townships in 2004 to 100% in 2012. The frequency of visits to township markets by farmers in rural villages increased from an average of five times per household per month in 2005 to

<sup>7</sup> The poverty standard was increased from CNY625 to CNY2,300 per year in 2011. Further analysis of impacts for poverty reduction is provided in Appendix 12, Table A12.3.



10 times per household per month in 2012. The frequency of visits to villages by agriculture extension workers was increased from 7 times every 6 months in 2005 to 12 times every 6 months in 2012. The percentage of villages with paved road access increased from 65% to 90%.

36. JECC was established as a state-owned enterprise under the Company Law of the PRC, maintaining its financial and managerial autonomy. This autonomy ensured strong accountability and allowed JECC management to implement the expressway project efficiently and manage the expressway effectively. JECC has attained international-standard capacity in project management through implementing the expressway project. The capacity building through both national and international training helped JECC implement the expressway in accordance with the highest technical standards and prevailing international practices. JECC also conducted 10 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, HPTD assigned key management and technical professionals of JECC 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**

37. On the basis of the economic and financial reevaluation, the project is rated *efficient* in achieving the outcome and outputs. The reevaluated economic internal rate of return (EIRR) for the expressway is 12.1%, down from 19.1% estimated at appraisal for the expressway and local roads. The lower EIRR was mainly due to the delayed completion, higher per capita cost, higher O&M cost and repavement cost, and lower traffic volume compared with the traffic forecast at appraisal. 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 indicates 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 11.0% if benefits were 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 10.0%, lower than the 12.0% cut-off rate. Appendix 9 shows the recalculated EIRR with the supporting assumptions.

38. The financial internal rate of return (FIRR) was recalculated at 5.5%, which is close to the appraisal estimates. The result was due to the much higher toll rates and the fact that no corporate income tax will be applied, in spite of the higher capital and O&M costs, and lower traffic. The after-tax weighted average cost of capital in real terms was calculated at 3.9% based on the actual financing mix of various sources. As the project's recalculated FIRR is higher than the revised weighted average cost of capital, the project is financially viable. 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 weighted average cost of capital if the revenue is 20% lower than forecast and the O&M cost is 20% higher than forecast. The financial reevaluation is in Appendix 10.

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

39. The project is *likely to be 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 Xiangxi Autonomous Prefecture and poverty reduction through robust economic growth and an integrated road network. Continued economic growth in the project area, assisted by the completion of the transport corridor between Changsha and Chongqing, will ensure a steady income from toll revenues for JECC to manage the expressway, bringing positive economic and social development to the project area.

40. The physical sustainability of the expressway was ensured by the use of sound engineering technology in its construction, which met prevailing international standards, and by the well-developed technical capacity of HPTD and JECC. In particular, the Aizhai suspension bridge, with a length of 1,176 meters, is the longest single-span suspension bridge crossing a valley in the world. It is also one of the first suspension bridges to use pylon and girder separation structure, rock anchor suspension with carbon fiber as a pre-stressed reinforcement material, and an innovative construction method of moving and installing steel-truss girders through cable track. The project expressway passes through some geotechnically complex terrain, but to cope with various technical difficulties and challenges JECC initiated 10 technical studies associated with construction of the project expressway. The innovative construction method for the Aizhai suspension bridge was awarded the first prize for Scientific and Technological Advancement in Hunan Province in 2013. Due to the technical innovation and significance for poverty reduction, Premier Wen Jiabao visited the expressway and the bridge in May 2012. The application of these technical research products for the project expressway's construction generated significant social and economic benefits. JECC is expected to continue practicing good management and sound financial administration.

41. HPTD and the local governments are 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 aimed at improving institutional arrangements, budgeting, and local government capacity for road management through outsourcing and market-oriented O&M. HPTD, through the local highway bureaus, responded to the government's call with proactive sustainability measures for the local roads and rural road networks in the province. This commitment and the priority assigned to local and rural road development, with steady budget support and multilevel input will ensure the sustainable development of local and rural roads, and provide remote and poor areas with easier access and greater connectivity.

## **E. Impact**

42. The project has promoted economic growth in the project area by increasing effective transport linkages, lowering transport costs, and facilitating trade and investment in the project area. The statistics show that annual per capita GDP of the project area increased by 95.40% from 2007 to 2013. The per capita GDP of Fenghuang district, Guzhang county, and Jishou county increased remarkably by 141%, 161.89%, and 81.76% respectively from 2007 to 2013. The higher growth rates in these areas confirm the project's economic impact in spurring fixed-asset investment and attracting service and secondary industries. The construction and operation of the expressway gave local governments significant opportunity to attract external investments and thus contribute to local industrial development along the expressway corridor. New industrial parks have been built close to the expressway, and more enterprises have started operating along the expressway alignment. A total of 1,869 rural enterprises with CNY35.85 billion in investments were established in five counties or cities along the alignment from 2010 to 2012. The operation of the expressway and the improved local roads have promoted tourism development in the project area. A total of 18.85 million tourists visited the

project area in 2012, 25.5% more than in 2011, and tourism revenue reached CNY10.45 billion in 2012, 34.8% more than in 2010.

43. The socioeconomic growth and increased employment opportunities in the project area have improved the living standards and income of local residents, particularly the poor. Temporary jobs, totaling 293,800 person-months, were created during expressway construction. During the expressway construction, 3,826 local laborers were directly employed along the alignment, 40% were ethnic minorities from Miao and Tujia ethnic minorities. For example, in Guzhang county, 615 were employed during construction, including 369 Tujia and 246 Miao ethnic minorities. The operation of the expressway has also created regular job opportunities for local residents, with 360 staff currently working in expressway operations sourced mainly from local villages. The local procurement of construction materials and supplies, including 36,000 tons of steel, 917 tons of cement, 25,000 cubic meters (m<sup>3</sup>) of timber, 522,000 m<sup>3</sup> of sand and stone, and 220,000 tons of gasoline and diesel, provided many indirect employment opportunities in the project area. The annual rural per capita net income of farmers in Jishou city, Fenghuang county, Huayuan county, Baojing county, and Guzhang county along the alignment increased by 85%–100% from 2007 to 2012. Poverty incidence in the project area decreased from 30% in 2005 to 15.5% by the end of 2013.<sup>8</sup>

44. The project expressway permanently acquired 6,711.3 mu (447.4 hectares [ha]) of land, 13.6% more than in the updated resettlement plan. Buildings totaling 41,743.7 square meters (m<sup>2</sup>) in area were demolished, 60.2% more than projected. A total of 2,470 households were affected by land acquisition and 227 households were affected by house demolition. The significant changes in the extent of land acquisition and house demolition were due mainly to realignment of contracts C15 and C16. The project local roads permanently acquired 60.1 ha, 28.8% less than in the updated resettlement plan. Buildings totaling 7,857.6 m<sup>2</sup> in area were demolished, 23.3% less than projected. A total of 1,785 households were affected by land acquisition and 72 households were affected by house demolition. The decrease in land acquisition and house demolition mainly resulted when the construction of 12 km of local roads was no longer financed under the project. A detailed evaluation of land acquisition and resettlement is provided in Appendix 11.

45. The project area covers one city and four counties in ethnic minority areas: 439,400 ethnic minority peoples including Miao and Tujia as the two major groups, accounting for 79% of the total population. Around 60% of the ethnic population have benefited from the project. An ethnic minority development plan (EMDP) was prepared to ensure that adverse impacts of the project could be mitigated and local communities would benefit from the project in a culturally appropriate way. JECC allocated adequate staff and resources to implement and supervise EMDP implementation, and provide status and progress reports. Hunan University monitored implementation of the EMDP. The major targets, including employment and training of ethnic minorities, were achieved and no adverse impacts were found during project implementation. The local roads have benefited the isolated ethnic minority communities and rural poor in the project area. Priority was given to ethnic minorities and poor families in construction-related employment. A total of 3,826 local laborers were directly employed in expressway construction—40% were ethnic minorities from Miao and Tujia ethnic groups. Overall, implementation of the EMDP was effective and efficient, and was well integrated with government-supported programs. Various government programs have been developed and implemented in the project area to improve the living standards of local ethnic minority groups

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<sup>8</sup> According to data from the Bureau of Poverty Reduction and Development of Xiangxi prefecture, which is based on the previous poverty line (CNY1,274).

and reduce poverty. Local governments have provided skills development training to villagers to promote income-generation activities including crop farming, livestock breeding, and tourism management. A total of 1,520 ethnic minorities were trained on agricultural technologies to take advantage of cash-cropping strategies, in which 1,130 trainees were provided with job opportunities in agri-enterprises.

46. The project expressway has benefited rural living conditions by giving communities more reliable and rapid access to outside products, services, information, and social links; and by allowing external service and product providers and social contacts to have improved access to rural communities. The project significantly spurred regional social development and poverty reduction in the project area, as evidenced by (i) a sizable 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 gain access to better medical services; and (v) the opening of many clinics in rural areas. A survey included in the social economic monitoring report indicated that the project's impact on social economic development and poverty reduction has been quite positive for 1.6 million beneficiaries. The social impact and poverty reduction report is in Appendix 12.

47. The project's environmental management plan (EMP) and monitoring program were implemented effectively. The environment and resettlement office of JECC oversaw EMP implementation. On-site mitigation measures were supervised and inspected by the supervision institutions under JECC. During implementation, environmental monitoring and mitigation measures were carried out according to the EMP and the soil erosion protection plan. Adverse environmental effects were minimized by (i) reusing spoil from tunnels and other excavations for embankment filling, (ii) minimizing excavation and potential erosion by optimizing the design of bridge substructures, (iii) applying integrated revegetation and structural methods to recover 1,471,885 m<sup>2</sup> of cutting slopes and embankments, (iv) rehabilitating 181.02 ha of borrow pits and 85.28 ha of spoil dump by using excavated topsoil, (v) installing wastewater collecting and treatment facilities in 14 toll stations and four service areas to reduce water pollution, and (vi) installing high-energy efficiency boilers that can meet national emission standards (13271-2001) in four toll stations and two service areas to reduce emissions of air pollutants.

48. According to the technical review report on the environment prepared by HPTD at project completion, the adverse environmental impact was mitigated adequately to comply with the project's EMP and no substantial environmental damage occurred construction. The impact on the ambient environment was minor and within the scope of the summary environmental impact assessment. Contractors complied with the EMP in protecting the environment and implementing mitigation measures in their construction schemes. During operation, environmental management involved the maintenance of slope protection works, landscape vegetation, the collection and treatment of wastewater and solid waste from service areas, and monitoring. These tasks were coordinated by JECC's environment and resettlement office and supervised by JECC's environmental management office. The environmental impact analysis is in Appendix 13.

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

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

49. The project is rated *successful*. It was (i) *highly relevant* to the development strategies of the government and ADB, (ii) *effective* in achieving outcomes, (iii) *efficient* in achieving the

outcome and outputs, and (iv) *likely to be sustainable*. The project was successfully implemented and achieved its main objectives of promoting economic growth and reducing poverty in Hunan province and the project area. Transport efficiency and safety in the project area improved as a result of the expressway and local road improvements. Implementation was effective and efficient. Although construction of the complex and innovative Aizhai suspension bridge resulted in delayed completion compared with the original plan, project implementation was carried out in an effective and efficient manner. The quality of work on the project expressway and the local roads was satisfactory. During implementation and operation, sound technical solutions and environmental mitigation measures were widely applied in strict compliance with national and local regulations and guidelines. The upgrading of local roads enabled the project to benefit rural and poor areas, and rural transport services to reach remote and poor areas. Institutional capacity was strengthened through the implementation of the human resource development plan. Knowledge gained during the project and capable staff resources were shared with other ongoing expressway projects. Substantial direct and indirect employment opportunities were created during implementation and the subsequent expressway O&M.

50. The expressway traffic volume was significantly lower than the appraisal forecast. Since the transport corridor between Changsha and Chongqing was completed, the through traffic has achieved higher growth momentum in the first 2 years of operation. 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 volume. For the time being, 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 5.5% and EIRR of 11.0% imply that financial and economic viability of the project needs to be strengthened through stronger government support.

## **B. Lessons**

51. To minimize the cost for rehabilitating local roads, some existing bridges were not included in the project for reconstruction or reinforcement. The improved road network together with the construction of other expressway projects in the area triggered a significant increase in traffic volume, which resulted in damage to Changyishao Bridge in Huayuan–Fenghuang. In June 2012, serious safety problems were detected that subsequently stopped vehicle traffic on the bridge. A temporary access road was later built to meet the demands of local traffic; bridge reconstruction commenced in December 2013 with expected completion by December 2015. Careful detection and assessment of existing bridges should be conducted at the design stage for future projects involving the rehabilitation of local roads. Meanwhile, the generated traffic by the improvement of local roads and construction of adjacent expressways must be considered.

## **C. Recommendations**

### **1. Project Related**

52. Although fewer road crashes (in million vehicle-km) occurred on the project expressway in 2012–2013 after the improvements were made, the government must continue its road safety efforts by taking all applicable engineering and management measures, as well as educating drivers and local residents. HPTD and JECC, in cooperation with the concerned government agencies, should maintain high safety standards and performance on the expressway and be ready to deal with safety issues.

53. As the O&M and toll collection functions for the project expressway reside in different government agencies, integrated financial statements have not been prepared for the operation of the project expressway. To achieve and maintain high standards of corporate governance, management practices, and financial reporting, HPTD, JECC, and the relevant departments should provide integrated financial statements for expressway operation, and closely monitor compliance with the loan covenants.

54. A project performance evaluation report should be prepared in 2017 or later. By that time, the project and the Changsha–Chongqing corridor will have been fully operating for more than 5 years. Therefore, project traffic, maintenance, physical condition, benefits attained, and impact on resettlement and poverty reduction can be better assessed.

## **2. General**

55. 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 realized. For a project that is part of a main transport corridor or a regional highway network, more realistic traffic volume forecasts are necessary, as the economic and regional integration benefits that will be derived from the transport corridor will only be fully realized over a longer period of time. In assessing any particular project, the PRC authorities should consider corridor connectivity and network capacity, make realistic traffic forecasts, and prioritize technical feasibility and financial viability of the relevant road section.

56. The counterpart road staff in Hunan has developed sufficient technical capabilities to manage various challenges during construction. For any anticipated external consulting services for roads, the environment, socioeconomic analysis, financial management, and advanced technologies should be given priority.

## DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Indicators and Targets		Monitoring Mechanisms
	At Appraisal	At Completion	
<p><b>Impact</b></p> <p>Sustainable economic growth and poverty reduction in Hunan province and the project area</p>	<p>Per capita rural incomes in the villages increased from CNY1,200 in 2005 to CNY2,700 in 2015</p> <p>The incidence of poverty in the project area decreased from 30% in 2005 to 15% in 2015</p> <p>During 2010–2020, GDP increased from CNY1,306 billion in 2009 by 7% in Hunan province</p> <p>During 2010–2020, GDP increased from CNY26.9 billion in 2009 by 7.5%–8% in the project area</p> <p>The percentage of new or renovated houses in the villages increased from 6% of total houses in 2005 to 10% in 2015</p> <p>The cash-crop area per capita increased from 0.4–0.7 mu in 2005 to 0.8–1.3 mu/per person in 2015</p> <p>In 5 years, the employment generated in the project area is 10% higher than in the control area</p> <p>Income from the nonfarm sector increased from 30% of total income in 2005 to 70% in 2015</p> <p>The number of rural enterprises increased by 10% within 3 years</p> <p>The number of tourists visiting the project area increased from 6.01 million in 2005 by 30% by 2015</p> <p>Social retail goods in Xiangxi region increased by 10% within 3 years</p> <p>Middle school dropout rates reduced by 10% by 2015</p> <p>Visits by doctors increased by 20% by 2015</p>	<p>Per capita rural incomes in the villages increased to CNY5,260 in 2013</p> <p>The incidence of poverty in the project area decreased to 15.5% in 2013<sup>a</sup></p> <p>GDP in Hunan province: CNY2,450 billion in 2013</p> <p>GDP in the project area: CNY41.9 billion in 2013</p> <p>The percentage of new or renovated houses in the villages is 12% in 2012</p> <p>Cash-crop area per capita: 0.92 mu/per person in 2013</p> <p>Employment generated in the project area higher than in the control area: in 2008: 8.0%, in 2012:10.6%</p> <p>In 2012, income from the nonfarm sector reached 74.9% of total income</p> <p>The number of rural enterprises increased by 23.31% from 1,660 in 2009 to 2,047 in 2011</p> <p>The number of tourists visiting the project area is 18.85 million in 2012, a 213.6% increase</p> <p>13.4% annual increase achieved from 2005 to 2008</p> <p>12% decrease achieved from 2005 to 2012</p> <p>29% increase achieved from 2005 to 2012</p>	<p>Resettlement monitoring report</p> <p>Resettlement monitoring report</p> <p>Hunan Statistics Yearbook, Hunan 12th Five-Year Plan</p> <p>Hunan Statistics Yearbook, Hunan 12th Five-Year Plan</p> <p>Resettlement monitoring report Project performance management system</p>

Design Summary	Performance Indicators and Targets		Monitoring Mechanisms
	At Appraisal	At Completion	
<p><b>Outcome</b></p> <p>Road transport efficiency is enhanced and improves safety in the project area.</p> <p>The Jishou–Chadong section of the Changsha–Chongqing western corridor is completed.</p> <p>The rural population in the project area has improved access to income-generating opportunities and social services.</p>	<p>Traffic volume for the expressway increased from an average of 5,642 annual average daily traffic in 2012 to 9,344 in 2015</p> <p>Travel time between Jishou and Chadong reduced to 1 hour</p> <p>Bus fares reduced from CNY0.4/km in 2005 by 10% by 2012</p> <p>The frequency of visits to township markets increased from 5 times/household/month in 2005 to 8 times/household/month in 2012</p> <p>The frequency of visits to villages by extension workers increased from 4–11 times every 6 months in 2005 to 7–14 times every 6 months in 2012</p> <p>The percentage of transport expenses of total expenses increased from 4.6%–6.6% in 2005 to 8%–12% in 2012</p> <p>The percentage of villages with paved road access increased from 65% to 85% by 2012</p> <p>Bus service availability increased from 50% of townships in 2004 to 100% by 2012</p> <p>The number of serious road accidents and fatalities in the project area reduced by 20% by 2012</p> <p>Freight charges reduced from CNY0.3/km in 2005 by 10% by 2012</p>	<p>Annual average daily traffic: in 2012: 4,286, in 2013: 5,985</p> <p>Achieved when the expressway was open to traffic in 2012</p> <p>Bus fare was reduced by 40% to CNY0.3/km</p> <p>The frequency of visits to township markets increased to 10 times/household/month in 2012</p> <p>The frequency of visits to villages by extension workers increased from 7 times every 6 months in 2005 to 13 times every 6 months in 2012</p> <p>The percentage of transport expenses of total expenses increased from 5% in 2005 to 11.4% in 2012</p> <p>The percentage of villages with paved road access increased to 90% by 2012</p> <p>Achieved when the local roads were completed in 2012</p> <p>82 accidents and 1 fatality in the project area in 2013, a 22% decrease by 2012</p> <p>Freight charges reduced by 33% by 2012</p>	<p>Auto-monitoring system by HPTD</p> <p>Monitoring by HPTD</p> <p>Social economic monitoring report</p> <p>Xiangxi Statistics Yearbook</p> <p>Social economic monitoring report</p>



Design Summary	Performance Indicators and Targets		Monitoring Mechanisms
	At Appraisal	At Completion	
<b>Output</b>			
Road infrastructure and associated facilities improved for local roads in the project area.	Road capacity increased to 850 passenger-car units/hour/direction for the class III Xiatio section	Achieved when the local road was completed in 2012	Project completion report
	Road capacity increased to 800 passenger-car units/hour/direction for the class IV Qianxi section by 2009	Achieved when the local road was completed in 2012	Project completion report
Road infrastructure and associated equipment and facilities improved along the expressway	Road capacity increased to 2,765 passenger-car units/hour at opening in 2010 by building a 64-kilometer (km) expressway.	Achieved when the expressway was completed in 2012	Project completion report
	Vehicle operating costs per car reduced from CNY1.79 per vehicle-km in 2005 to CNY1.50 (constant price) per vehicle-km in 2015	VOC saving per vehicle-km per car: CNY0.3 per vehicle-km in 2013	Survey by Hunan Provincial Communications Department
	Safety audits implemented during design and construction	Safety audits were conducted during design and construction	PPR and project completion report
	Equipment procured and installed for road safety, toll collection, communications, and weigh stations	Equipment procured and installed during construction	PAM, PPR, and project completion report
	Plans for land acquisition and resettlement implemented	Plans for land acquisition and resettlement were implemented during construction	Independent agency authorized by Hunan Provincial Communications Department
	Acid rain pollutants (sulfur dioxide) and carbon dioxide emissions reduced by 20% by 2010.	Both targets were achieved in 2010	Environmental monitoring report, PAM, and project completion report
	Environment at the project site protected and adverse environmental impacts minimized by implementing mitigation measures	The environment management plan was well implemented during construction	
	The welfare of minorities protected and the project's adverse impacts minimized by implementing an ethnic minority's development plan	The ethnic minority's development plan was well implemented during construction	Minorities development plan monitoring report, PAM, and project completion report
	HIV/AIDS and health risks for construction workers and service providers controlled	More than 80% of construction workers understand the basic knowledge of HIV/AIDS prevention	Social economic monitoring report

Design Summary	Performance Indicators and Targets		Monitoring Mechanisms
	At Appraisal	At Completion	
Private sector participation encouraged in the project expressway	An operation and maintenance concession awarded when the expressway meets the required financial performance	Required financial ratio was not reached. When the project expressway was opened to traffic in March 2012, JECC signed a franchise agreement with HPTD, authorizing the Hunan provincial expressway administration bureau to operate the project expressway and operate the toll collection function	Midterm review mission and project completion report
Domestic capacity strengthened in project management, quality control, road maintenance management system road safety, and monitoring and evaluation	47 person-months of HPTD staff receive international training	41 person-months of HPTD staff received international training	Midterm review mission and project completion report
	Local staff receive training under management action plan to be prepared by 2007	3,470 local staff received pre-job training	Capacity building report by international consultants
	Survey techniques adopted to assess changes in work practices and behavior to measure the effectiveness of the capacity building component	Survey techniques were adopted.	Midterm review mission and project completion report

JECC = Hunan Jicha Expressway Construction and Development Company, mu = Chinese unit of measurement (1 mu = 666.67 m<sup>2</sup>), GDP = gross domestic product, ha = hectare, HPTD = Hunan provincial transport department, km = kilometer, PAM = project administration manual, PPR = project progress report.

<sup>a</sup>This is based on the poverty line before 2011. The poverty line was increased from CNY625 to CNY2,300 per year in 2011.

Source: Asian Development Bank and Hunan Jicha Expressway Construction and Development Company.

## CHRONOLOGY OF MAJOR EVENTS IN THE PROJECT'S HISTORY

Approval of PPTA	2 September 2004
Fact-finding mission	20–26 April 2005
Management review meeting	10 June 2005
Appraisal mission	15–20 June 2005
Staff review committee meeting	21 July 2005
Loan negotiations	14–15 November 2005
Board circulation	24 November 2005
Loan approval	15 December 2005
Loan agreement signing	15 November 2006
Inception mission	12–15 December 2006
Loan effectiveness	23 February 2007
Approval of first consulting services contract	6 March 2007
Approval of first civil works contracts	27 June 2007
Start of civil works	September 2007
First loan review and hand-over mission	13–16 November 2007
Transfer project administration to PRC Resident Mission	27 December 2007
First disbursement	8 August 2008
Second loan review mission	28 October–3 November 2008
Approval of first equipment contract	20 March 2009
Midterm review mission	14–23 October 2009
Approval of first loan reallocation	9 April 2010
Fourth loan review mission	12–17 April 2010
Fifth loan review mission	7–14 April 2011
First repayment of loan principal	1 June 2011
Approval of second loan reallocation	7 July 2011
Sixth loan review mission	7–14 May 2012
Original loan closing date	30 June 2012
Approval of third loan reallocation	12 November 2012
Final disbursement	7 December 2012
Actual loan closing date	20 June 2013
Extension of loan closing date	for 6 months 31 December 2012
Project completion review mission	2–9 September 2013

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ADB = Asian Development Bank, PPTA= project preparatory technical assistance, PRC = People's Republic of China.

## PROJECT COSTS AND FINANCING PLAN

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

Component	Appraisal Estimate			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
<b>A. Base Cost</b>						
1. Expressway civil works	207.44	118.06	325.50	183.39	492.46	675.85
2. Equipment	7.64	10.07	17.71	0.19	15.50	15.69
3. Land acquisition and resettlement	0.00	31.96	31.96	0.00	58.81	58.81
4. Consulting services and training	1.51	4.78	6.29	1.11	7.96	9.06
5. Local roads	12.41	8.28	20.69	8.00	46.93	54.93
6. Project administration	0.37	20.95	21.32	0.00	29.66	29.66
7. Tax and duties	0.00	9.88	9.88	0.00	0.00	0.00
<b>Subtotal (A)</b>	<b>229.37</b>	<b>203.98</b>	<b>433.35</b>	<b>192.69</b>	<b>651.31</b>	<b>844.00</b>
<b>B. Contingencies</b>						
1. Physical contingencies	12.45	12.35	24.80	0.00	0.00	0.00
2. Price contingencies	0.00	20.04	20.04	0.00	0.00	0.00
<b>Subtotal (B)</b>	<b>12.45</b>	<b>32.39</b>	<b>44.84</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>C. Interest and Commitment Charges during Construction</b>	<b>22.16</b>	<b>19.16</b>	<b>41.32</b>	<b>7.86</b>	<b>46.23</b>	<b>54.09</b>
<b>Total</b>	<b>263.98</b>	<b>255.53</b>	<b>519.51</b>	<b>200.55</b>	<b>697.54</b>	<b>898.09</b>

Sources: Asian Development Bank and Hunan Jicha Expressway Construction and Development Company.

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

Source	Appraised			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
Asian Development Bank	208.00	0.00	208.00	200.55	0.00	200.55
Ministry of Transportation	0.00	59.74	59.74	0.00	76.80	76.80
Hunan Provincial Government	55.98	38.60	94.58	0.00	221.38	221.38
Domestic Commercial Banks	0.00	157.19	157.19	0.00	399.36	399.36
<b>Total</b>	<b>263.98</b>	<b>255.53</b>	<b>519.51</b>	<b>200.55</b>	<b>697.54</b>	<b>898.09</b>

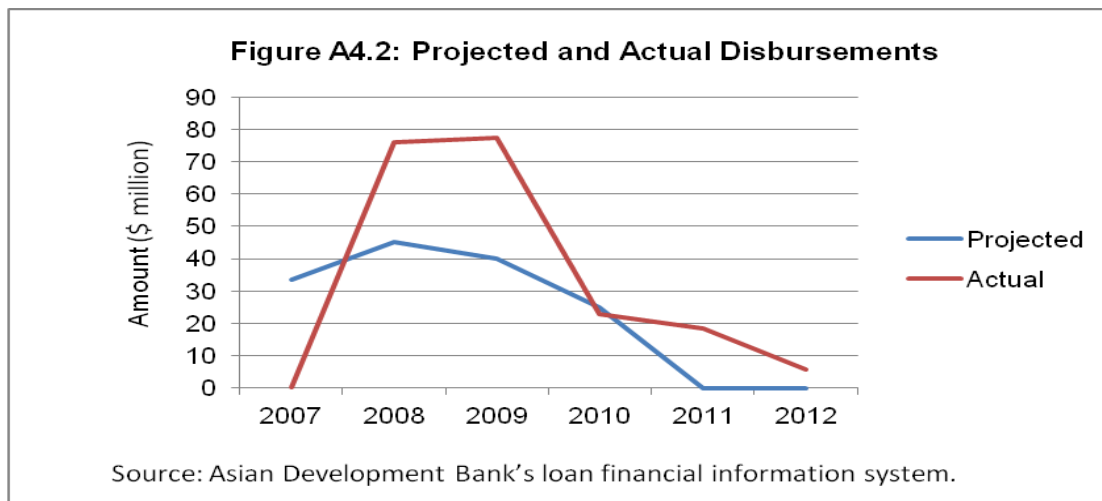
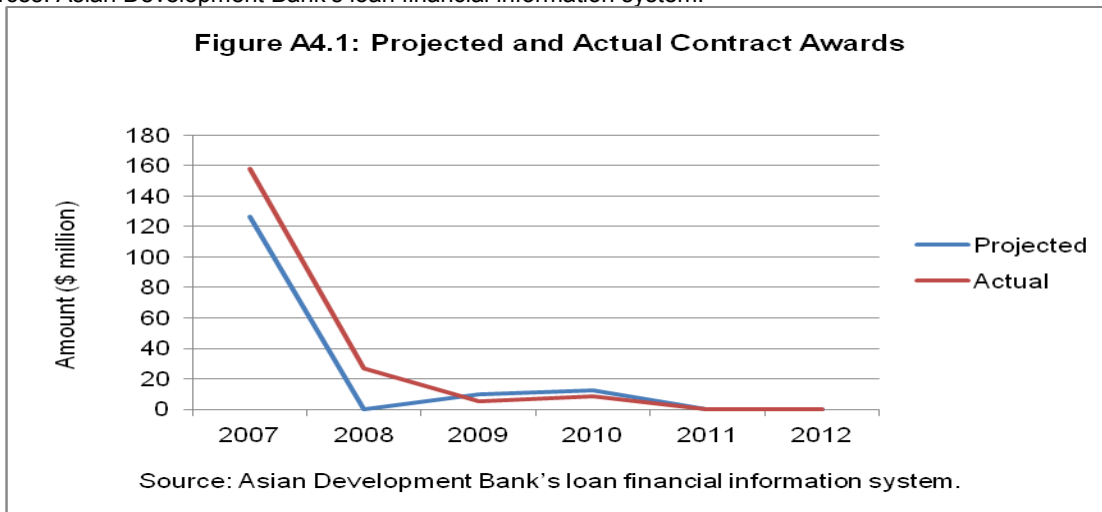
Sources: Asian Development Bank and Hunan Jicha Expressway Construction and Development Company.

**PROJECTED AND ACTUAL CONTRACT AWARDS AND DISBURSEMENTS**

**Table A4.1: Projected and Actual Contract Awards and Disbursements**  
(\$ million)

Year	Contract Awards			Disbursements		
	Projected	Actual	Actual/Projected (%)	Projected	Actual	Actual/Projected (%)
2007	126.50	157.97	125.0	33.5	0.21	0.6
2008	0.00	26.58	2,658.0	45.00	76.10	169.1
2009	10.00	4.97	49.7	40.00	77.33	193.3
2010	12.50	8.28	66.2	25.00	22.78	91.1
2011	0.00	0.00	0.0	0.00	18.41	1,841.0
2012	0.00	0.00	0.0	0.00	5.72	572.0
<b>Total</b>	<b>149.00</b>	<b>197.80</b>		<b>143.50</b>	<b>200.55</b>	

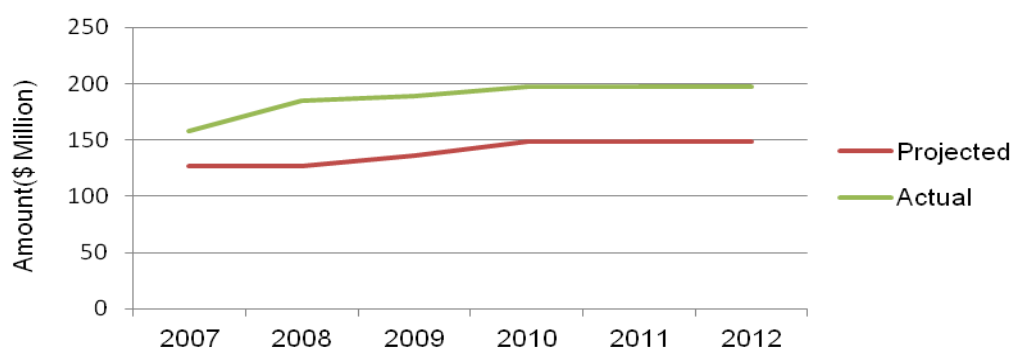
Sources: Asian Development Bank's loan financial information system.



**Table A4.2: Cumulative Projected and Actual Contract Awards and Disbursements**  
(\$ million)

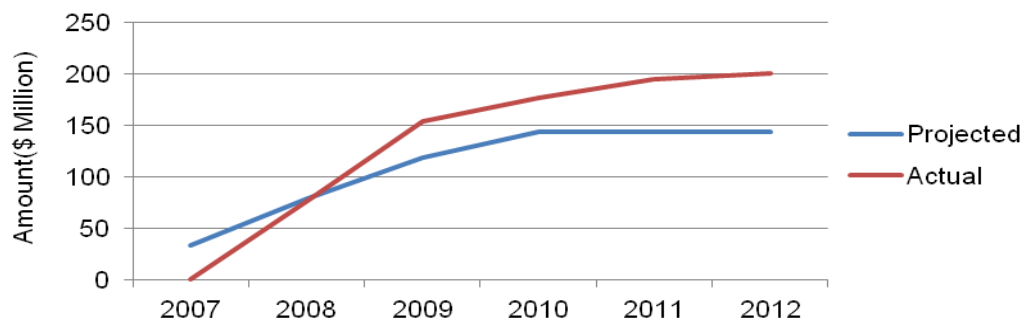
Year	Contract Awards		Disbursements	
	Projected	Actual	Projected	Actual
2007	126.50	157.97	33.50	0.21
2008	126.50	184.55	78.50	76.31
2009	136.50	189.52	118.50	153.64
2010	149.00	197.80	143.50	176.42
2011	149.00	197.80	143.50	194.83
2012	149.00	197.80	143.50	200.55
<b>Total</b>	<b>149.00</b>	<b>197.80</b>	<b>143.50</b>	<b>200.55</b>

**Figure A4.3: Cumulative Projected and Actual Contract Awards**



Source: Asian Development Bank's loan financial information system.

**Figure A4.4: Cumulative Projected and Actual Disbursements**



Source: Asian Development Bank's loan financial information system.

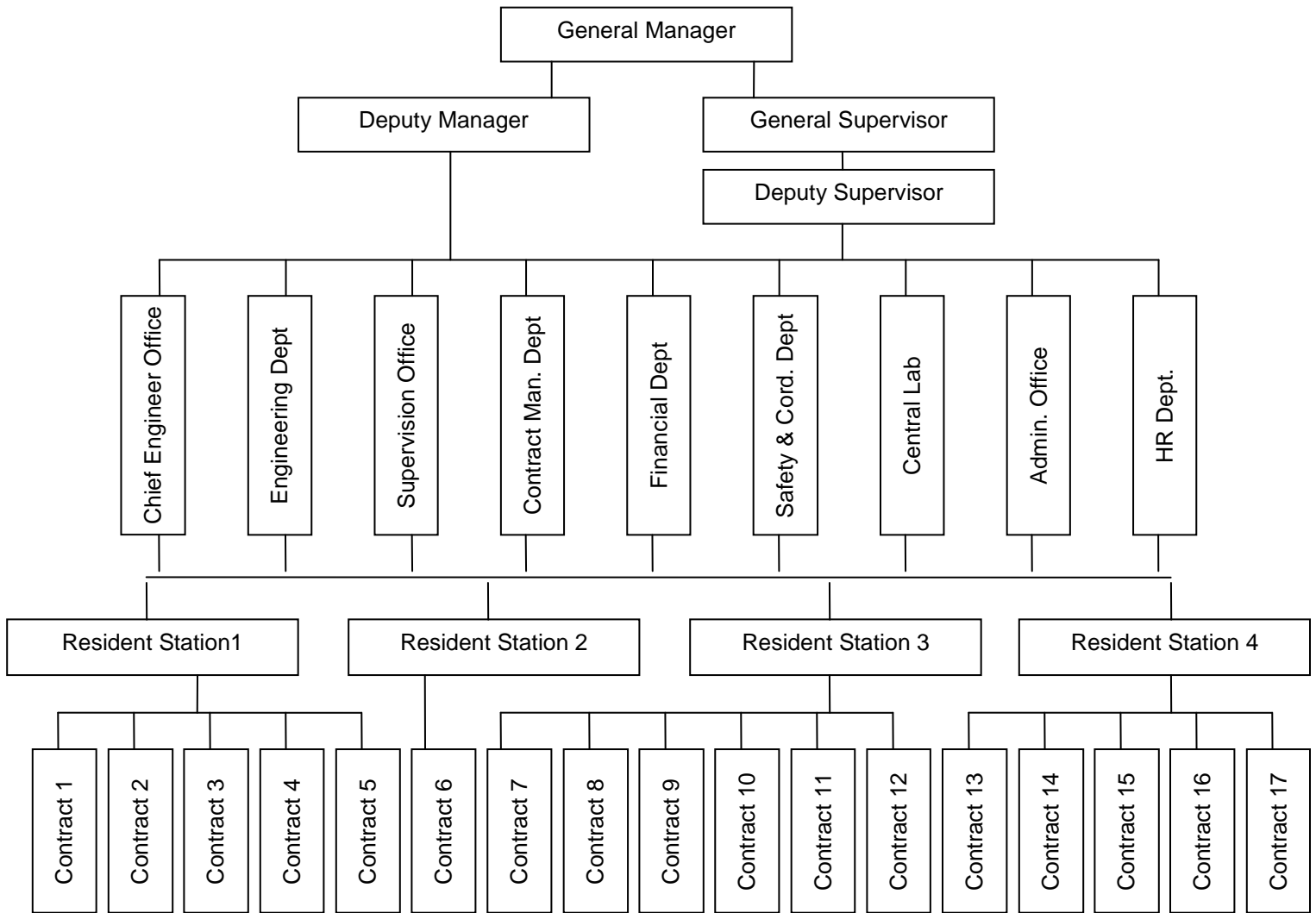
### APPRAISAL AND ACTUAL IMPLEMENTATION SCHEDULES

	2005			2006				2007				2008				2009				2010				2011				2012				
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
<b>A. Loan Processing</b>	X																															
1. Loan Approval	X																															
2. Board Consideration			X																													
3. Loan Effectiveness			X																													
<b>B. Civil Works</b>																																
1. Procurement																																
2. Earthworks																																
3. Pavement																																
4. Bridge																																
5. Large Suspension Bridge																																
6. Culvert and Underpass																																
7. Interchange																																
8. Tunnel																																
9. Traffic Engineering																																
10. Connection Road																																
11. Landscape																																
12. Building and Ancillary																																
<b>C. Equipment</b>																																
1. Toll Collection, Surveillance, and Communication																																
2. Ventilation System																																
3. Expressway Management																																
<b>D. Local Road</b>																																
<b>E. Land Acquisition and Resettlement</b>																																
<b>F. Consulting Services and Training</b>																																
1. International																																
2. Domestic																																

Source: Hunan Jicha Expressway Construction and Development Company.

**ORGANIZATION CHARTS**

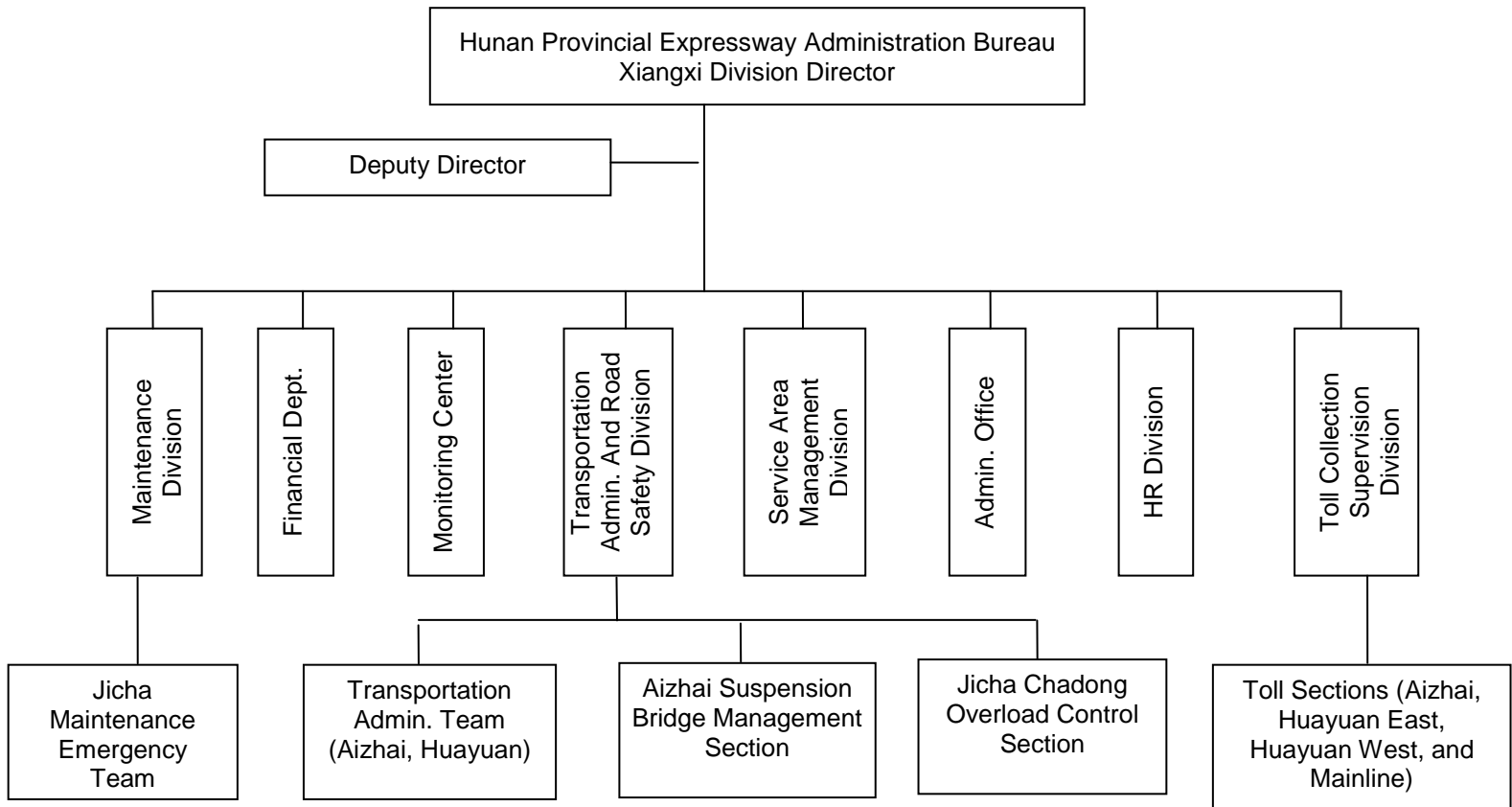
**Figure A6.1: Organization Chart of Hunan Jicha Expressway Construction and Development Company**



Source: Hunan Jicha Expressway Construction and Development Company.



**Figure A6.2: Organization Chart During Operation**



Source: Hunan Jicha Expressway Construction and Development Company.

**STATUS OF COMPLIANCE WITH LOAN COVENANTS**  
(as of September 2013)

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
	<b>Implementation Arrangements</b>		
1.	HPTD shall be the Project Executing Agency responsible for the overall implementation of the Project and direct implementation of the local road component of the Project through the concerned local communications bureaus.	PA, Schedule, para. 1	Complied with.
2.	JECC shall be the Implementing Agency, responsible for coordinating and monitoring all construction activities of the Project expressway and operating the Project expressway. JECC'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 JECC 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.	PA, Schedule, para. 2	Complied with.
	<b>Sector</b>		
3.	Construction quality. HPG shall, through HPTD, ensure that (i) the Project is constructed in accordance with the revised technical standards of highway engineering issued by the Borrower's Ministry of Transportation; (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, Schedule, para. 4	Complied with. The design standards, construction supervision, and quality control followed national standards and internationally accepted practices.
4.	Road safety. At least six months prior to the commencement of operation of the Project expressway, (a) HPG shall cause HPTD 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 traffic police personnel, in accordance with national and HPG standards, to patrol the Project expressway and enforce the national laws and regulations. HPG shall cause HPTD to utilize its traffic control and surveillance systems to implement road safety measures for the Project.	PA, Schedule, para. 5	Complied with. The safety implementation plan was submitted to ADB and road safety audits were conducted during project design and construction. Effectiveness of the road safety management measures is indicated by significantly reduced road crashes

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
			on the project expressway in the project area.
5.	<p>Operation and Maintenance Concession.</p> <p>(a) Upon commencement of operation of the Project expressway, HPG shall cause HPTD to award a maintenance concession to a qualified enterprise through a competitive bidding, it being understood that the maintenance concession shall be in effect only until the operation and maintenance agreement mentioned under paragraph (b) below is entered into.</p>	PA, Schedule, para. 9(a)	Partially complied with. When the project expressway was opened to traffic in March 2012, JECC signed a franchise agreement with HPTD, authorizing the Hunan provincial expressway administration bureau to operate the project expressway and the toll collection function.
6.	<p>(b) When the Project expressway's operating-profit ratio exceeds 10%, HPG shall cause HPTD to use its best efforts to award an operation and maintenance concession through a competitive bidding process equally open to all enterprises including the private enterprises. It is understood that such enterprise shall undertake all the obligations applicable to JECC with respect to the Project expressway. HPG shall ensure that HPTD, with the help of an international consultant to be engaged under the ADB financed Hunan Roads Development II Project, prepare the bidding documents and the operation and maintenance concession framework, which specifies the concession period and selection criteria, and ensures adequate pricing and transparent auctioning. HPG shall ensure that HPTD submit the bidding documents and the operation and maintenance concession framework to ADB for review by 30 June 2006.</p>	PA, Schedule, para. 9(b)	Complied with. The operation and maintenance concession framework was submitted to ADB for review by 30 June 2006. The required financial ratio has not yet been reached.
7.	<p>Local road maintenance. HPG shall cause HPTD (a) to prepare a local road maintenance action plan and implement it during implementation of the Project; (b) to establish a system during the operation of the Project for an efficient prioritization of road maintenance works; (c) to provide a training program to strengthen the capacity of local government maintenance units; and (d) to secure a sustainable funding for the maintenance of the local roads of the Project.</p>	PA, Schedule, para. 11	Complied with. Xiangxi Autonomous Prefecture Transportation Bureau, which is responsible for maintaining local roads, has adequate capacity and funds to maintain the roads.
8.	<p>Axle loads. JECC shall install vehicle axle-weighing equipment at selected points. Before opening the</p>	PA, Schedule, para. 13	Complied with. Vehicle weighing stations were

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
	Project expressway, JECC shall submit to ADB the plan for operation of the vehicle weigh stations, including the prescribed axle-load limits and penalties for infringement.		established and are operating on the project expressway and local roads. The requested plan was submitted to ADB in September 2011.
9.	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 the HEPB vehicle emission standards as well as the national vehicle emission standards be enforced.	PA, Schedule, para. 18	Complied with. The report on measures for enforcing the national vehicle emission standards was submitted to ADB in September 2011.
10.	Transport services. HPG shall, through HPTD, in coordination with the other relevant agencies, ensure that adequate road transport services are in place so that the Project's benefits filter down to the rural poor in the Project area. In particular, HPG shall, through HPTD, ensure that the ongoing or planned public transport facilities projects of the Xiangxi Prefecture are implemented in tandem with the Project.	PA, Schedule, para. 25	Complied with. Rural buses are operating on the improved local roads.
11.	Monitoring and evaluation. HPG shall cause HPTD to, and JECC shall, with the help of the consultants engaged under the Project, monitor and evaluate Project impacts through the Project Performance Management System (PPMS) to ensure that the Project facilities are managed effectively and the benefits, particularly to the poor, are maximized. HPG shall cause HPTD to (i) hire a qualified domestic institute to carry out the monitoring activities through a competitive bidding by 31 December 2006; (ii) ensure that the relevant local government agencies, including local statistics offices, collect the data to measure the indicators contained in the PPMS prior to implementation of the Project, at completion of the Project, and biennially for 5 years thereafter; and (iii) submit to ADB the reports summarizing the key findings of monitoring.	PA, Schedule, para. 26	Being complied with. The monitoring of indicators for 5 years after project completion is not yet due.
	<b>Environmental</b>		
12.	Environment. JECC shall ensure that (i) the Project be designed, constructed, operated and maintained in accordance with the environmental laws and regulations of the Borrower, the Environmental Policy (2002) of	PA, Schedule, para. 17	Complied with. The environment and resettlement office of JECC oversaw EMP

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
	ADB, and the Environmental Impact Assessment; (ii) any adverse environmental impacts arising from the Project be minimized by implementing the mitigating measures and environmental monitoring program presented in the Environmental Impact Assessment; 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 Environmental Impact Assessment.		implementation. On-site mitigation measures were supervised and inspected by the supervision institutions under JECC.
	<b>Social</b>		
13.	Land acquisition and resettlement. JECC 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 Policy on Involuntary Resettlement; (iv) ensure compensation and resettlement assistance be given to the affected people prior to dispossession and displacement; (v) ensure that the counterpart funds for land acquisition and resettlement activities be timely provided; (vi) meet any obligations in excess of the RP budget estimate; and (vii) ensure that the affected people will be at least as well off as they would have been in the absence of the Project.	PA, Schedule, para. 19	Complied with. The actual compensation rates were higher than the rates in the resettlement plan because of incremental resettlement costs. The government mobilized additional resources to fill the gap, and ensured timely compensation and resettlement assistance to the affected people.
14.	Land acquisition and resettlement. JECC 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 investigations to monitor progress semi-annually and to evaluate results through annual survey updates for two years after completion of the resettlement, and forward reports to ADB and JECC 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, Schedule, para. 20	Complied with. An external consultant was hired for external resettlement monitoring and evaluation. ADB received seven external resettlement M&E reports for the expressway and two M&E reports for the local roads.
15.	Land acquisition and resettlement. JECC shall update	PA, Schedule,	Complied with. The

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
	the RP, including the local road component, (i) upon completion of detailed design, including rehabilitation plans for seriously affected villages, and prior to commencement of land acquisition; (ii) upon the completion of the detailed measurement survey for both the Project expressway and local roads components, as described in the RP, and prior to the commencement of civil works, submit any modifications to ADB for its concurrence prior to award of contracts; and (iii) as necessary to reflect any significant material changes in Project scope or other causes, and submit any such changes to ADB for its approval. JECC shall disclose any updated RP to the affected people. JECC shall ensure that civil works contract specifications include requirements to comply with the RP and entitlements for permanent and temporary impacts to the affected people, and shall supervise the contractors to ensure compliance with requirements of the RP, applicable law, and ADB policy.	para. 21	project impact section of the plan was updated in 2006 after preliminary design, but changes in the plan arising from project impact beyond the project redline were made quite often during construction at the request of local communities along the alignment. The resettlement plan was also updated in 2010 due to realignment of the expressway.
16.	Land acquisition and resettlement. HPG shall, through HPTD, ensure that (i) any land acquisition carried out by the municipal or county communications bureaus for the local roads component of the Project also be implemented in accordance with the RP, and (ii) adequate resettlement compensation funds be available and properly utilized.	PA, Schedule, para. 22	Complied with. The resettlement plans for local roads were updated in 2009 and two M&E reports were prepared by the external monitor to verify compliance.
17.	Poverty reduction. JECC shall cause the contractors involved in the Project implementation to maximize their employment of local poor people who meet the job and efficiency requirements for the construction of the Project facilities. Such workers shall be provided with adequate on-the-job training. HPG shall cause HPTD to monitor the impacts of the Project on poverty in accordance with the guidelines set forth in the Project Performance Monitoring System (PPMS).	PA, Schedule, para. 23	Complied with. The project significantly encouraged regional social development and poverty reduction in the project area, as evidenced by (i) a sizable increase in per capita GDP and farmers' incomes; (ii) a decrease in poverty incidence; and (iii) increased employment and income for the poor during construction and operation.
18.	Ethnic minority development. HPG shall cause HPTD, in coordination with the relevant agencies, to implement the Ethnic Minorities Development Plan (EMDP) and ensure that (i) ethnic minorities benefit from the Project	PA, Schedule, para. 24	Complied with. Implementation of the EMDP enhanced the sharing of project

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
	in accordance with ADB's Policy on Indigenous Peoples; (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.		benefits with local communities, as well as Miao and Tujia people. Hunan University was hired to monitor and evaluate the EMDP, and submitted four monitoring reports to ADB.
19.	Gender and development. JECC shall follow ADB's <i>Policy on Gender and Development</i> 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 causing the contractors to maximize employment of women in connection with the Project. HPG shall cause HPTD to monitor under PPMS the Project's effects on women during Project implementation.	PA, Schedule, para. 27	Complied with. The project has promoted gender development in the project area. With improved road condition, women have benefited from increased marketing opportunities, better access to education and, health services, and improved engagement in social activities and career development.
20.	Health risks. HPG, through HPTD, and JECC, in coordination with the Center for Disease Control of HPG and 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 HPTD, 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, Schedule, para. 28	Complied with. The requirements were included in bidding documents and civil works contracts, and information was disseminated to transport operators during operation of the project expressway and roadside stations.
21	Women and child labor. JECC shall ensure that all civil works contractors engaged under the Project (i) provide timely payment of wages and safe working conditions to all workers including male and female workers (with such requirements being included in civil works contract and monitored by the construction supervision consultant engaged under the Project); (ii) provide women's employment, where appropriate and pay equal wages for equivalent work; (iii) do not employ child labor in Project activities in accordance with the relevant laws and regulations of the Borrower.	PA, Schedule, para. 29	Complied with. During construction and operation, the obligation was fulfilled to ensure no child labor used, equal payment between men and women for same work, and safe working conditions to all workers.

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
	<b>Financial</b>		
22.	Counterpart financing. HPG shall, through HPTD, take all necessary measures to ensure that (i) JECC can successfully construct the Project expressway; (ii) the local communications bureaus in the Project area can successfully construct, manage, and maintain the local roads; and (iii) the construction and improvements of local roads are completed prior to the completion of the Project expressway.	PA, Schedule, para. 3	Partially complied with. Constraints of counterpart financing delayed the construction of the local roads, which were completed after completion of the project expressway.
23.	Tolls. At least six months prior to the commencement of operation of the Project expressway, HPG shall cause HPTD to 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.	PA, Schedule, para. 6	Complied with. The requested report was submitted to ADB on time.
24.	Tolls. For the first 3 years of full operation of the Project expressway, HPG shall cause HPTD, on an annual basis, to review the toll structure and levels and report to ADB any significant difficulties in meeting the principles established under the Highway Law.	PA, Schedule, para. 7	Being complied with. The toll structure and amounts were submitted to ADB for review.
25.	Financial performance ratio. Except as ADB shall otherwise agree, JECC shall not incur, for each fiscal year commencing from the fifth year of the full operation of the Project expressway, any debt unless reasonable forecast of the revenues and the expenditures of JECC shows that the estimated net revenues of JECC for each fiscal year during the term of the debt to be incurred shall be at least 1.2 times the estimated maximum debt service requirements of JECC for any succeeding fiscal year on all debt of JECC, including the debt to be incurred.	PA, Schedule, para. 8	Being complied with. Pro forma analysis indicates that the debt service coverage ratio of not less than 1.2 could only be achieved in 2018.



No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
26.	Financial reporting. During construction and for the first 5 fiscal years of commercial operation, JECC shall submit to ADB the certified copies of its annual accounts and financial statements, audited by external and qualified auditors appointed by HPTD (all in English), within six months after the end of each relevant fiscal year. HPG shall cause HPTD to establish and maintain during implementation and operation of the Project an internal audit unit, composed of full-time accountants, to undertake timely audit of project accounts in accordance with generally accepted accounting principles.	PA, Schedule, para. 14	Complied with. The required APA/AFS were submitted on time.
27.	Asset management. HPG shall cause HPTD to (i) prepare an asset management development plan, with the assistance of consultants engaged under the Project, which will establish a computerized database system and promote the use of modern equipment; and (ii) provide a training program to enhance staff skills at provincial, county, and township levels.	PA, Schedule, para. 31	Complied with.
<b>Human Resource Development and Training</b>			
28.	Human resources development and training. Prior to the start of civil works for the Project expressway, JECC, in consultation with HPTD, shall develop and implement a human resources development plan, acceptable to ADB, that identifies the managerial, staffing, and investment requirements of JECC 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, JECC 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 JECC employees by those who will participate in the international training. On completion of each international training, JECC shall submit to ADB an evaluation of the training.	PA, Schedule, para. 15	Complied with. The number of out-of-country study tour and training programs were readjusted to five due to domestic requirements for more staff to participate in each out-of-country training and study tour.

No.	Covenants	Reference to Loan and/or Project Agreements	Status of Compliance
29.	Human resources development and training. JECC shall use its best efforts to ensure that the persons participating in the international training workshops remain in the employment of the transport sector in Hunan Province after Project completion to ensure knowledge sharing and continued implementation of workshops for other staff members.	PA, Schedule, para. 16	Complied with. JECC organized on-the-job training courses for 3,470 participants on subjects including construction supervision, quality control, contract management, construction safety, tunnel construction, and pavement design.
	<b>Others</b>		
30.	Change in ownership and operation. In the event that HPG or JECC plan (i) any change in ownership of the Project facilities, or (ii) any sale, transfer, or assignment of HPG's or JECC's interest in the Project expressway, or (iii) to lease out, or contract out, or otherwise modify JECC's responsibilities for operation and maintenance of the Project expressway, HPG and JECC shall, at least six months prior to the implementation of such plan, consult ADB and obtain ADB's consent. HPTD and JECC shall ensure that such transfer be made in a transparent manner.	PA, Schedule, para. 12	Complied with. When the project expressway was opened to traffic in March 2012, JECC signed a franchise agreement with HPTD, authorizing the Hunan provincial expressway administration bureau to operate the project expressway.
31.	Anticorruption. HPG shall cause HPTD to ensure that (i) a supervisory body is established for prevention of undue interference in business practices and adequate resources are made available for its effective operation, (i) a leading group of officials from the Supervision Division of HPTD is located in offices involved in the bidding, construction and other operational activities under the Project, (iii) briefings between HPTD and Prosecutor's Office are held on a regular basis with respect to sharing of information on or warning about detected corrupt practices, (iv) periodic inspections on the contractor's activities related to fund withdrawals and settlements are carried out, and (v) a dual-signing system, in which the civil-works contract winner also signs an anticorruption contract with the employer is introduced.	PA, Schedule, para. 30	Complied with.

ADB = Asian Development Bank, APA= Audited Project Account, AFS = Audited Financial Statement, HPG = Hunan Provincial Government, HPTD = Hunan Provincial Transportation Department, JECC = Hunan Jicha Expressway Construction and Development Company.

## DETAILS OF EXPRESSWAY CIVIL WORKS AND EQUIPMENT PACKAGES

**Table A8.1: Civil Works**

No.	Contractor	Mode of Procurement	Contract Date	Country	Contract Amount (CNY)	Contract Amount (\$ equivalent)
C1	Hunan Road & Bridge Construction Group	ICB	6 Aug 2007	PRC	135,996,050	21,636,472.83
C2	Shandong Road & Bridge Group	ICB	6 Aug 2007	PRC	190,940,718	30,377,968.02
C3	Yueyang Roads & Bridges Construction	ICB	6 Aug. 2007	PRC	149,181,161	23,734,175.64
C4	Huaihua Road and Bridge Construction	ICB	6 Aug. 2007	PRC	147,492,153	23,465,460.66
C5	Third Engineering of China Railway Seventh Group	ICB	27 Feb 2008	PRC	155,980,840	24,815,979.64
C6	Hunan Road & Bridge Construction Group	ICB	6 Aug. 2007	PRC	720,852,476	114,684,985.40
C7	China Railway No. 13 Bureau Group	ICB	6 Aug 2007	PRC	196,963,939	31,336,240.39
C8	Fujian Construction Engineering Group Company	ICB	6 Aug 2007	PRC	149,947,896	23,856,160.37
C9	Yunnan Sunlight Highway and Bridge.	ICB	6 Aug 2007	PRC	86,181,239	13,711,119.08
C10	Hunnan Road & Bridge Construction Group	ICB	6 Aug 2007	PRC	73,433,900	11,683,064.20
C11	Fourth Engineering of China Railway No. 22 Bureau Group	ICB	24 Oct 2007	PRC	138,333,904	22,008,416.83
C12	Hunnan Road & Bridge Construction Group	ICB	6 Aug 2007	PRC	81,706,461	12,999,198.31
C13	Handan Guangtai Highway Engineering	ICB	6 Aug 2007	PRC	105,093,925	16,720,058.07
C14	China Railway 12th Bureau Group	ICB	24 Oct 2007	PRC	51,909,086	8,258,545.22
C15	Hunnan Road & Bridge Construction Group	ICB	6 Aug 2007	PRC	129,876,495	20,662,874.08
C16	No. 6 Engineering Company, Hunan Province	ICB	15 Aug 2008	PRC	173,327,792	27,575,816.08
C17	Hunan Road & Bridge Construction Group	ICB	15 Apr 2008	PRC	81,808,672	13,015,459.71
<b>Total</b>					<b>2,769,026,707</b>	<b>440,541,994.60</b>

ADB = Asian Development Bank, CNY = yuan, ICB = international competitive bidding, No. = number, PRC = People's Republic of China.

Sources: Jicha Expressway Construction and Development Company.

**Table A8.2: Equipment Procurement**

No.	Item	Procurement Mode	Contract Date	Country of Procurement	Contractor	Contract Amount (CNY)	Contract Amount (\$ equivalent)
1.	Portable GPS Device	IS	16 Apr 2009	PRC	Beijing Skyway Science and Technology	1,155,000.00	183,756.26
2.	Plotter and Camera	IS	16 Apr 2009	PRC	Changsha FullXuntong Technology Development	61,800.00	9,832.15
3.	Software Development Platform	DC	25 Mar 2009	PRC	ESRI China (Beijing)	158,000.00	25,137.22
<b>Total</b>						<b>1,374,800.00</b>	<b>218,725.63</b>

CNY = yuan, DC = direct contracting, IS = international shopping, PRC = People's Republic of China.

Sources: Hunan Jicha Expressway Construction and Development Company.

## ECONOMIC REEVALUATION

1. The project comprises a 64-kilometer (km) four-lane expressway from Jishou to Chadong and improvement of 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 *Guidelines for the Economic Analysis of Projects* of the Asian Development Bank (ADB).<sup>1</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 is increased, allowing vehicles on the project expressway to drive shorter distances, at faster speeds, and with lower VOCs. Congestion on the G319 has been relieved, resulting in shorter travel time and lower VOCs. Due to better transport conditions, traffic has been generated and operating costs in the corridor reduced. The evaluation period covers the implementation period of 2006–2012 and operation during 2012–2031. The analysis uses 2012 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 for unskilled labor; and converting main construction material costs to economic prices.

### A. Revised Traffic Forecast

3. The traffic forecast for the project expressway was updated based on the information provided in the executing agency's project completion report. Actual expressway traffic in 2012 and 2013, corridor traffic, and the impact of connecting roads and the latest local socioeconomic development status were considered. The project expressway is one of eight road corridors planned under the West Development Strategy, connecting Changsha and Chongqing. In Hunan province, the Changsha–Changde section was opened to traffic in 1998, and the Changdu–Jishou section in 2009. When the project expressway was opened in March 2012, the whole corridor expressway was fully complete. The parallel G319 road extends from Xiamen in Fujian province to Chengdu in Sichuan province (520 km in Hunan province). The condition of the G319 was poor with sections of technical standard class II, III, and IV. Traffic counts on the parallel section of G319 are 5,768 passenger car units (pcu)/day in 2011 and 5,110 in 2012, when the expressway was opened to traffic. In 2012, 45% of the corridor traffic used the project expressway, benefiting from better transport conditions and shorter distance, especially for passenger vehicles, large freight trucks, and through traffic. G319 now mainly serves local traffic. Traffic increased by 39% in 2013, and traffic on the project expressway (including generated traffic) is estimated to significantly increase (by 20%) in the early years of operation during 2014–2015, then slow to 7%–6% during 2016–2025 and to 4% during 2025–2031.

4. The actual traffic, as well as the updated forecast traffic, for the project expressway was significantly lower than the appraisal estimates for the early years of operation (Table A9.1).

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<sup>1</sup> ADB.1997. *Guidelines for the Economic Analysis of Projects*. Manila.

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

Year	Appraisal Estimates (PCU/day)			Updated Forecast as of End of 2013 (PCU/day)		
	Expressway	G319	Total	Expressway	G319	Total
2012	6,000	2,392	<b>8,392</b>	4,286	5,110	<b>9,396</b>
2019	12,645	2,904	<b>15,549</b>	11,292	5,133	<b>16,425</b>
2029	21,345	4,317	<b>25,662</b>	19,124	6,580	<b>25,704</b>

G319 = National Highway 319, PCU = passenger car unit.

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

## B. Benefits

5. At appraisal, the following economic benefits were quantified for the expressway component: (i) savings in VOCs resulting from shorter travel time and improved traffic conditions, (ii) savings in the value of passenger time, (iii) benefits to generated traffic, (iv) savings resulting from fewer accidents, and (v) value-added of tourism attributable to the project. These benefits were reevaluated with updated information.

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 are used in the calculation. VOCs are 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) are estimated to be CNY0.3–CNY2.11 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 are reduced as a result of reduced congestion. The unit VOC saving for G319 traffic is CNY0.14–CNY0.72 per vehicle-km. For generated traffic, half of the VOC savings are considered as benefits.

7. Passenger travel time savings are estimated for different types of passenger vehicles. The average passenger time value is derived from the per capita income of Hunan province in 2012, and is assumed to rise by 6%–8% annually, 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 for the with- and without-project scenarios.

8. The tourism benefits are significant. The project area is rich in tourism resources, which were not tapped before the project due to the poor transport conditions. Opening of the expressway brought 18.85 million tourists to the project region in 2012, 25.5% more than the previous year; tourism revenues were CNY10.45 billion in 2012, 34.8% higher than the previous year. The value added of the tourism sector is based on the net of output at economic prices less the cost of production (sum of all intermediate input costs, wages, and annualized investment costs).

9. Benefits related to changes in road accidents were not considered due to lack of sufficient data on accident rates of the expressway and the G319, before and after opening of the expressway.

### C. Economic Internal Rate of Return Reevaluation

10. The reevaluated economic internal rate of return (EIRR) for the project expressway is 12.1%, significantly lower than the 19.1% estimated at appraisal. The lower EIRR is mainly due to the delayed completion, higher capital cost, higher operation and maintenance (O&M) and repavement cost, and lower traffic volume compared with the traffic forecast at appraisal. The reevaluated EIRR is close to the cut-off rate of 12% (Table A9.2).

11. Sensitivity analysis tests the impacts of (i) increased O&M costs, (ii) decreased benefits, and (iii) a combination of the two scenarios (Table A9.3). The project's economic viability largely depends on traffic volume and 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 connectivity of the expressway network and help the expected traffic growth to materialize.

**Table A9.2: Economic Reevaluation of the Project Expressway**  
(CNY million)

Year	Costs			Benefits			Net Benefits
	Capital	O&M	Total	VOC Savings	Time Savings and Tourism Benefits	Total	
2006	161.73	...	161.73	...	-	-	-161.73
2007	353.50	...	353.50	...	-	-	-353.50
2008	1,345.24	...	1,345.24	...	-	-	-1,345.24
2009	1,405.99	...	1,405.99	...	-	-	-1,405.99
2010	438.38	...	438.38	...	-	-	-438.38
2011	877.70	...	877.70	...	-	-	-877.70
2012	638.27	16.14	654.41	202.16	236.22	438.39	-216.02
2013	...	16.62	16.62	263.85	293.92	557.77	541.14
2014	...	21.78	21.78	308.68	327.63	636.32	614.54
2015	...	24.79	24.79	364.20	369.44	733.64	708.85
2016	...	27.10	27.10	389.69	388.72	778.42	751.32
2017	...	29.44	29.44	416.97	409.36	826.33	796.89
2018	...	31.78	31.78	446.16	431.43	877.59	845.80
2019	...	34.15	34.15	477.39	455.05	932.44	898.29
2020	...	36.55	36.55	510.81	480.32	991.13	954.58
2021	...	38.92	38.92	541.09	503.22	1,044.31	1,005.39
2022	...	46.72	46.72	573.17	527.47	1,100.64	1,053.92
2023	...	50.95	50.95	607.89	553.70	1,161.59	1,110.65
2024	...	53.05	53.05	644.71	581.53	1,226.24	1,173.19
2025	...	59.46	59.46	683.77	611.05	1,294.82	1,235.36
2026	...	61.96	61.96	710.65	631.37	1,342.02	1,280.06
2027	267.52	25.15	292.67	738.60	652.48	1,391.09	1,098.42
2028	...	25.90	25.90	770.93	676.90	1,447.83	1,421.93
2029	...	31.33	31.33	803.20	701.28	1,504.48	1,473.15
2030	...	34.63	34.63	835.30	725.54	1,560.84	1,526.21
2031	...	37.23	(2,706.92)	866.59	749.17	1,615.76	4,322.69

**Economic internal rate of return = 12.1%**

( ) = negative, ... = data not available, O&M = operation and maintenance, VOC = vehicle operating cost.  
Source: Asian Development Bank.

**Table A9.3: Sensitivity Analysis**

Item	Changes		EIRR
	O&M Cost	Benefits	
Base Case			12.1%
Changes (+/-)	+20%	-10%	12.0%
		-20%	11.0%
	+20%	-20%	10.0%
		-20%	9.9%

EIRR = economic internal rate of return, O&M = operation and maintenance.  
 Source: Asian Development Bank.

## FINANCIAL REEVALUATION

1. The financial reevaluation was undertaken in accordance with the *Guidelines for the Financial Management and Analysis of Projects* of the Asian Development Bank (ADB).<sup>1</sup> The project has both revenue and nonrevenue components. The 64-kilometer (km) four-lane expressway from Jishou to Chadong is the revenue component. Financial reevaluation is conducted on the revenue-generating component. The evaluation period covers implementation during 2006–2012 and operation during 2012–2031.

### A. Basic Assumptions

2. To calculate the financial internal rate of return (FIRR), 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 34.4% higher than the appraisal estimates. The estimated expressway operation and maintenance (O&M) expenses are based on the actual expenses of Hunan Provincial Expressway Administration Bureau (HPEAB) for O&M of the project expressway. The expressway maintenance cost comprises CNY60,000/km for routine maintenance and CNY4.4 million/km for repavement, scheduled for 2027. The operation cost is estimated based on the average salaries and number of employees for expressway administration and operation. The operation cost and routine maintenance cost are assumed to increase by 3% in real terms annually to ensure the good working condition of the expressway facilities. The depreciation calculation uses an average depreciation ratio of 5%; depreciation expenses are excluded from the FIRR calculation.

3. The project expressway will generate financial benefits by collecting tolls. The actual toll revenues for 2012 are included and the future toll revenues will increase consistent with the traffic growth. Current toll rates for the expressway comprise (i) a base toll of CNY0.50 for a passenger car unit (pcu)/km; (ii) weight-based toll for freight vehicles with a base toll of CNY0.09/ton-km, normal load rate of CNY0.04–CNY0.09/ton-km, and overload punishment of up to 5 times the base toll; and (iii) charges for use of the Aizhai suspension extra-large bridge of CNY20.00–CNY50.00 per vehicle depending on the vehicle type. The overall toll is much higher than the appraisal estimates, which anticipated a base toll rate of CNY0.35/passenger car/km. The toll has not increased in real terms. Non-toll vehicles, including trucks for fresh agriculture products, account for 5% of total traffic. Except for the business tax and surcharges of 3.36% of toll revenues, no corporate income tax is charged on the expressway as the operating entity, HPEAB (including its affiliates), is an administrative unit and not a corporate entity. All revenues and expenses are expressed in 2012 prices for the FIRR calculation. The residual value of fixed assets is based on the economic life of expressway facilities.

### B. Financial Internal Rate of Return

4. The recalculated FIRR is 5.5% (Table A10.1), close to the appraisal estimate. The result was due to higher capital cost, higher repavement and O&M costs, and lower traffic, despite the higher toll rates and tax factors (para. 3). Calculation of the after-tax weighted average cost of capital (WACC) in real terms utilizes the actual financing mix and related cost of various financing sources. The revised WACC is 3.9% (Table A10.2), 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.

<sup>1</sup> ADB. 2005. *Financial Management and Analysis of Projects*. Manila.



**Table A10.1: Financial Internal Rate of Return**  
(CNY million)

Year	Costs			Revenue	Net Cash Flow after Business Tax
	Capital	O&M	Total		
2006	170.24	...	170.24	...	(170.24)
2007	372.10	...	372.10	...	(372.10)
2008	1,416.04	...	1,416.04	...	(1,416.04)
2009	1,479.99	...	1,479.99	...	(1,479.99)
2010	461.45	...	461.45	...	(461.45)
2011	923.89	...	923.89	...	(923.89)
2012	671.86	16.99	688.85	93.04	(598.94)
2013	...	17.50	17.50	129.86	108.00
2014	...	22.92	22.92	209.14	179.18
2015	...	26.10	26.10	261.04	226.17
2016	...	28.52	28.52	276.53	238.72
2017	...	30.99	30.99	306.79	265.50
2018	...	33.46	33.46	339.12	294.26
2019	...	35.95	35.95	432.96	382.47
2020	...	38.47	38.47	475.08	420.64
2021	...	40.97	40.97	514.56	456.30
2022	...	49.18	49.18	555.51	487.67
2023	...	53.63	53.63	598.27	524.54
2024	...	55.84	55.84	743.14	662.33
2025	...	62.59	62.59	793.28	704.04
2026	...	65.22	65.22	825.02	732.08
2027	281.60	26.47	308.07	865.32	528.18
2028	...	27.26	27.26	909.97	852.13
2029	...	32.98	32.98	1,099.95	1,030.01
2030	...	36.45	36.45	1,144.68	1,069.76
2031	(2,747.79)	39.19	(2,708.59)	1,188.13	3,856.80

**Financial internal rate of return = 5.5%**

( ) = negative, ... = data not available, O&M = operation and maintenance.

Sources: Asian Development Bank and Hunan Provincial Transportation Department.

5. Sensitivity analysis tests 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 revenue is 20% lower than forecast and the O&M cost is 20% higher than forecast (Table A10.3).

**Table A10.2: Weighted Average Cost of Capital**

Item	ADB Loan	MOT Grant	Domestic Bank	Hunan Government	Total
Capital cost (CNY million)	1,305	399	1,960	1,832	5,496
Weighting (%)	23.7	7.3	35.7	33.3	100.0
Nominal cost (%)	3.0	8.0	6.6	8.0	
Income tax rate (%)	0.0		0.0		
Tax adjusted nominal cost (%)	3.0	8.0	6.6	8.0	
Inflation rate (%)	1.6	3.0	3.0	3.0	
Real cost (%)	1.4	4.9	3.5	4.9	
Weighted component (%)	0.3	0.4	1.2	1.6	
<b>Weighted average cost of capital</b>					<b>3.5%</b>

ADB = Asian Development Bank, MOT = Ministry of Transport

Sources: Asian Development Bank and Hunan Provincial Transportation Department.

**Table A10.3: Sensitivity Analysis**

Item	Change in		FIRR
	O&M Cost	Revenue	
Base Case	0%	0%	5.5%
Change	+20%	-10%	4.8%
		-20%	4.1%
	+20%	-20%	4.0%

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

Source: Asian Development Bank.

### C. Financial Performance of Jicha Expressway Construction and Development Company

6. According to the project agreement, the project company will comply with the financial covenant on the debt service coverage ratio of not less than 1.2 starting from the 5th 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. Based on the actual performance of Hunan Jicha Expressway Construction and Development Company (JECC) from 2012-2013, and projections its financial performance, these ratios for period 2012-2032 are presented in Table A10.4.

**Table A10.4: Financial Performance of Project Expressway**

Financial Ratios	2013	2015	2018	2019	2022
Debt to Equity Ratio	58%	55%	46%	42%	29%
Working Ratio	18.5%	10.1%	10.0%	84%	9.0%
Debt Service Coverage Ratio	0.26	0.81	1.06	1.38	1.76

Source: Asian Development Bank.

7. The analysis indicates that the debt service coverage ratio of not less than 1.2 could only be achieved after 2018. Similar to the situation of newly constructed expressways, cross-subsidy from other expressways under HPEMB would be relied on to cover the shortages of

internally generated cash flows in the initial years of operation. Completing the missing links of the expressway network, improving the connectivity of toll and nontoll roads, and providing better transport services would be important for the project expressway to generate adequate revenues to comply with the loan covenant. Improving the efficiency of O&M of the expressway and exercising effective control of operating costs are also important.

## LAND ACQUISITION AND RESETTLEMENT

1. The Asian Development Bank (ADB) approved a resettlement plan for the expressway component during loan processing, and Hunan Jicha Expressway Construction and Development Co. (JECC) prepared an updated resettlement plan based on the detailed design and submitted to ADB in December 2006. According to the updated resettlement plan, the expressway construction will result in loss of land, houses, and other assets. A total 5,905.65 *mu* (393.71 hectares [ha]) of land were to be acquired permanently for the expressway, about 39.8% of which is farmland, comprising paddy fields (23.6%), dry land (16.0%), and vegetable-growing land (0.2%). The permanent land acquisition will affect 2,131 households. A total of 26,056.9 square meters (m<sup>2</sup>) of houses or buildings were to be demolished resulting in the relocation of 195 households. In addition, the project would acquire about 2,047.37 *mu* of temporarily borrowed land for construction purposes. The resettlement cost estimate of CNY238.88 million was included in the project cost. During implementation, JECC submitted a realignment of the expressway section under C15 and C16 and a supplementary resettlement plan with a due diligence report to ADB in 2010. In addition, the Xiangxi Autonomous Prefecture Transportation Bureau prepared two resettlement plans and submitted them to ADB for the local roads component, including the Guzhang–Baojing and Huayuan–Fenghuang roads in May 2009, prior to commencement of construction.

### A. Scope of Land Acquisition and Resettlement

2. According to the project completion report prepared by JECC, the expressway permanently acquired 6,711.3 ha of land, 13.6% more than estimated at appraisal. A total of 41,743.7 m<sup>2</sup> of buildings were demolished, 60.2% more than estimated. A total of 2,470 households were affected by land acquisition, and 227 by house demolition. 84% of affected people are ethnic minorities, such as Miao Nationality, Tujia Nationality, and etc. The ethnic minority issues and concerns were fully considered in the formulation and implementation of the RP. The increase in land acquisition and house demolition was mainly due to the realignment of C15 and C16 (an additional 575.7 *mu* of land and 68 households). 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	Impacts		Variation	
	Updated RP (2006)	Actual	Quantity	Percentage
Land Acquisition				
Permanent (mu)	5,905.7	6,711.3	805.65	13.6
of which, farmland (mu)	2,432.3	2,766.3	334.04	13.7
Temporary (mu)	2,047.4	2,220.9	173.53	8.5
Building Demolition (m <sup>2</sup> )	26,056.9	41,743.7	15,687	60.2
Households Affected				
By land acquisition (households)	2,131	2,470	339	15.9
By building demolition (households)	195	227	32	16.4

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

Sources: Updated resettlement plan and the project completion report prepared by JECC.

3. The land acquisition and resettlement impacts of the local roads component were unknown during loan preparation. Two separate resettlement plans with due diligence reports for the Guzhang–Baojing and Huayuan–Fenghuang local roads were prepared and submitted to

ADB in May 2009, as per loan covenant. On the Guzhang–Baojing road, a total of 630.3 mu of land was permanently acquired and 6,443.1 m<sup>2</sup> houses and/or buildings were demolished, affecting 48 households. On the Huayuan–Fenghuang road, 284.6 mu of land were permanently acquired and 1,414.5 m<sup>2</sup> of houses and/or buildings demolished, affecting 24 households. The decreased amount of land acquisition and house demolition was mainly due to land acquisition being minimized during implementation and the change in financing for the construction of 12 km of local road, which was no longer financed under the ADB project. Table A11.2 presents the actual project impacts versus those estimated in the resettlement plans for the local roads.

**Table A11.2: Land Acquisition and Resettlement Impacts of Local Roads**

Item	Impacts		Variation	
	Resettlement Plan	Actual	Quantity	Percentage
<b>A. Local Road (Guzhang-Baojing)</b>				
Land Acquisition				
Permanent (mu)	813.3	630.3	(183.0)	(22.5)
Temporary (mu)	16.2	38.7	22.5	138.9
Building Demolition (m <sup>2</sup> )	8,001.0	6,443.1	(1,558)	(19.5)
Households Affected				
By land acquisition (households)	569	565	(4)	(0.7)
By building demolition (households)	77	48	(29)	(37.7)
<b>B. Local Road (Huayuan-Fenghuang)</b>				
Land Acquisition				
Permanent (mu)	472.4	284.6	(187.8)	(39.8)
Temporary (mu)	17.0	10.0	(7.0)	(41.2)
Building Demolition (m <sup>2</sup> )	2,240.0	1,414.5	(826)	(36.9)
Households Affected				
By land acquisition (households)	1,642	653	(989)	(60.2)
By building demolition (households)	25	24	(1)	(4.0)

( ) negative value, m<sup>2</sup> = square meter.

Sources: Local roads resettlement plans and local transport bureaus.

## B. 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 land acquisition policy reform (No. 28 Decree by the State Council of the PRC) in October 2004, and the subsequent policy update by the Hunan provincial government in April 2005, as well as a detailed resettlement and compensation policy issued by Xiangxi Tujia and Miao Autonomous Prefecture in January 2007. The implemented compensation rates for land acquisition and house relocation for the expressway construction were higher than those in the updated resettlement plan (Tables A11.3 and A11.4). In addition, the external monitoring reports indicate that the actual implemented compensation rates for the realigned section and local roads component were higher than those in the supplementary resettlement plan and local roads resettlement plans, which is mainly due to negotiations as well as inflation influence.

**Table A11.3: Compensation Rates<sup>a</sup> of Permanent Land Acquisition:  
Updated Resettlement Plan versus Actual (CNY/mu)**

<b>Land Type</b>	<b>Updated Resettlement Plan</b>	<b>Actual</b>
Paddy field	18,032	24,400
Dry land	14,504	16,800
Vegetable land	26,026	39,200
Orchard	12,622	14,640~15,555
Forest	6,698	5,490~10,980
Other	11,850	7,320~32,800

<sup>a</sup> Includes land compensation and resettlement subsidy.

Sources: Updated resettlement plan and external resettlement monitoring report.

**Table A11.4: Compensation Rates of Houses and Structures:  
Updated Resettlement Plan versus Actual (CNY/square meter)**

<b>Item</b>	<b>Updated Resettlement Plan</b>	<b>Actual</b>
Brick–concrete	280	340~380
Brick–timber	220	300~330
Wood–tile	160	280~310
Simple	90	110~160

Sources: Updated resettlement plan and external resettlement monitoring report.

### **C. Rehabilitation and Income Restoration**

5. The external resettlement monitoring report indicates that the average landholding per capita declined by 0.08 mu (7.5%) from 1.07 mu to 0.99 mu due to land acquisition. Land adjustment within a village or village group has been a sensitive topic for the resettlement program. Based on consultation with village heads and representatives of affected households, most affected households prefer cash compensation rather than land adjustment. Consequently, the compensation agreement with each family was signed and each family received a bank saving card. The compensation for land acquisition was disbursed directly to affected households, except for 25% of the land compensation fee,<sup>1</sup> which was retained in the affected village committee to be used for public purposes on the basis of consultation. The land compensation fund was largely used for income-generating activities, such as planting industrial crops and animal husbandry. For example in Shu'er village, around 85% of the land compensation fund was paid directly to affected households in cash, and the remaining 15% was used as a community fund to help affected households by providing technical services for the development of vegetable planting as well as other green foods. In 2010, the planting area of rapeseed was increased by 77.7% from that in 2005, cotton by 50%, sugar cane by 61.6%, tobacco by 87.5%, and vegetables by 20%.

6. Local governments along the expressway provided regular training for local farmers including affected people, to enable them to gain skills in agriculture and nonagriculture jobs. As of March 2012, 4,864 farmers in the project-affected area had received skills training, of which 4,225 farmers were recruited by various enterprises. In addition, with the expressway opening to

<sup>1</sup> The land compensation fee is usually six times the Average Annual Output Value (AAOV) and the resettlement subsidy is four times the AAOV (the latter was paid entirely to the affected persons). On this basis, the affected persons received 85% and the village committee 15%.

traffic, local enterprises and tourism have been growing rapidly. The gross product value of mid-sized and small enterprises in the project area increased by 17.4% per annum during 2005–2010, and provided a total of 9,253 jobs for local surplus labor. The external monitor conducted an income survey for 195 sample households and concluded that the income of affected households had increased (Table 11.5). The survey conducted by the external monitor for local roads also indicates that the incomes of affected households increased after the land acquisition.

**Table A11.5: Income Restoration of Affected Sample Households**

Per Capita Income (CNY/year)	2006		2010	
	Households	Percentage	Households	Percentage
900	20	10.26	0	0.00
900–3,000	38	19.48	22	11.28
3,000–6,000	25	12.82	43	22.05
6,000–8,000	95	48.72	102	52.31
>8,000	17	8.72	28	14.36
<b>Total</b>	<b>195</b>	<b>100.00</b>	<b>195</b>	<b>100.00</b>

Sources: External resettlement monitoring report.

7. The relocated households built new houses after receiving the compensation fund. Since the number of relocated households is not significant, no concentrated resettlement site is situated along the alignment. Affected households selected new housing plots according to their preference with the help of local governments, and built new houses by themselves within the village. After relocation, the housing conditions of the affected households are significantly improved. Most new houses have two floors with about 300 square meters on average, and are of better quality than the houses that were not affected. The vulnerable group was provided with special assistance in selecting house plots and constructing new houses. The questionnaire on house relocation surveyed by the external monitor indicates that 35.29% people are very satisfied and 60.29% are satisfied.

#### **D. Resettlement Cost**

8. Implementation of land acquisition and resettlement cost CNY369.59 million, an increase of 55% from the CNY238.87 million in the updated resettlement plan. The significant increase in costs is mainly due to the increase in land acquisition and house demolition, as well as the increased compensation rates (Table 11.6). In addition, the total land acquisition and resettlement cost for the local roads component is around CNY28.19 million, which is less than in the resettlement plans mainly due to the decreased land acquisition and house demolition.

**Table A11.6: Land Acquisition and Resettlement Costs:  
Resettlement Plan versus Actual (CNY)**

<b>Item</b>	<b>Original Resettlement Plan (2005)</b>	<b>Updated Resettlement Plan (2006)</b>	<b>Actual</b>	<b>Increase (%)</b>
Permanent land acquisition	64,716,073	61,619,611	100,418,817	63
Young crop compensation	6,471,607	6,471,607	10,041,882	55
Temporary land use fee	6,697,166	6,496,010	8,691,325	34
House compensation and allowance	5,819,564	5,487,607	16,948,569	209
Trees and other land attachment compensation fee	19,414,822	19,414,822	38,516,629	98
Infrastructure compensation fee	38,829,644	38,829,644	114,510,257	195
Training fee	1,400,000	1,400,000	1,400,000	0
Monitoring fee	1,000,000	1,000,000	1,000,000	0
Vulnerable group and households at risk assistance	1,962,211	1,901,285	3,580,499	88
Administration, tax, and contingencies	98,965,240	96,258,559	74,492,019	(23)
<b>Total</b>	<b>245,276,327</b>	<b>238,879,145</b>	<b>369,599,997</b>	<b>55</b>

( ) = negative value.

Sources: Original resettlement plan (2005), updated resettlement plan (2006), and the project completion report prepared by JECC.

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

9. Jishou city and Huayuan county resettlement management offices for the project construction made public announcements on the detailed policies of land acquisition and resettlement prior to implementation of land acquisition and house relocation. The announcement was to publicly disclose the scope of land acquisition, inform the affected people of the specific amount of land acquisition and house relocation, as well as the amount of compensation for each affected household. JECC worked with county resettlement management offices to communicate with affected people through public announcement cars, radio and television programs, posters, newspapers, bulletins, village message boards, and resettlement booklets. A complaint-handling mechanism was established to enable affected people to appeal to local officials, contractors, or resettlement management offices when they encountered any problems. No formal complaints were received during implementation.

## **F. Monitoring and Evaluation**

10. Hunan University was engaged for external monitoring and evaluation (M&E) of land acquisition and resettlement implementation for the expressway, and Jishou University was recruited for external M&E of land acquisition and resettlement implementation for the local roads component. Seven resettlement M&E reports for the expressway were submitted to ADB from 2007 to 2011. The M&E reports, prepared in the early stage, were of poor quality because the monitor lacked resettlement experience. ADB provided intensive training for the external monitor and implementing agency officials during the loan review mission, and the quality of subsequent M&E reports was improved. The last external M&E report concluded that income restoration of affected households had been achieved. In addition, ADB received two resettlement M&E reports for the local roads component, which concluded that the income of affected households increased.



## **G. Lessons**

11. Implementation of land acquisition and resettlement for the realigned section commenced prior to submitting the supplementary resettlement plan to ADB due to the tight schedule of expressway construction (as advised by the implementing agency). ADB expressed serious concerns and urged the executing and implementing agencies to prepare and submit a supplementary resettlement plan for the realigned section together with a due diligence report on the actual resettlement implementation status. Fortunately, the land acquisition and resettlement for the realigned section was implemented in line with the policy framework formulated in the updated resettlement plan. The lessons from the project include (i) ADB should be advised of any changes in scope in a timely manner, and (ii) the experience and qualification of a resettlement monitor should be fully considered during the recruitment process.

## **SOCIAL, POVERTY, AND ETHNIC MINORITY DEVELOPMENT**

1. The social and poverty analysis, conducted during project preparation, shows that the remoteness and inadequate road infrastructure of the project area are among the main causes of the area's high incidence of poverty. Due to geographic isolation and the high cost of motorized transport, most farmers in the mountainous rural villages had limited mobility and did not have adequate and sufficient access to production, markets, income generation, migration, job opportunities, and social development activities in the project area. Based on the analysis, the project will help accelerate regional economic growth, stimulate interregional trade, and reduce poverty in the project area by (i) enhancing road transport efficiency and safety; (ii) improving access to and interaction with other regions by providing a link in the Changsha–Chongqing corridor, one of eight high-priority western corridors; (iii) improving access for rural minority villages to income-generating opportunities and social services; and (iv) generating employment opportunities directly and indirectly, and increasing economic activities and tourism development. Improved transportation will increase income opportunities from cash-crop farming or seasonal work involving migration, increase contact with urban centers, and make trips to markets and social services easier, thereby contributing to poverty reduction in the region. The ethnic minority development plan includes measures to extend the project benefits to local ethnic minority groups in a culturally appropriate way.

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

2. 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 the project area increased by 95.40% from 2007 to 2013. During the same period, the per capita GDP of Fenghuang district increased remarkably by 141%, Guzhang county by 161.89%, and Jishou County by 81.76% (Table A12.1). The statistics also show a decrease in GDP in Huayuan county during 2009–2010 due to the significant impact of the financial crisis, but a steady increase in the following years. A significant decrease was reflected in Baojing county as well due to a severe drought in the region in 2013.

3. The project has given local governments a significant opportunity to attract external investments. Construction and operation of the expressway has facilitated external investments and contributed to local socioeconomic development along the expressway corridor. In addition to the employment of 29.38 million person-days of skilled and unskilled workers, the project investment significantly stimulated local industrial development, particularly in the construction materials, energy, and services sectors. By the end of 2013, the primary industries in the project area accounted for 9.6% of total GDP, secondary industries for –18.7%, and tertiary industries for 109.1%. The decrease in secondary industries was due to the continuous impact of the financial crisis, while the contribution of tertiary industries to GDP increased from 60.7% to 109.1% with the significant improvement of road transport efficiency and logistics. Furthermore, the number of rural enterprises increased by 1,869, an increase of 12.6% from 2010. The fixed assets of rural enterprises exceeded CNY35.85 million; these enterprises provided 9,253 skilled and unskilled jobs to rural residents.

**Table A12.1 Growth of Gross Domestic Product in the Project Area**  
(CNY/person)

Project County/District	2007	2008	2009	2010	2011	2012	2013
Jishou							
GDP per capita	18,676	20,805	22,675	24,730	28,482	31,590	33,945
Growth rate (%)		11.40	8.99	9.06	15.17	10.91	7.45
Fenghuang							
GDP per capita	6,320	7,543	8,412	9,801	11,974	13,236	15,231
Growth rate (%)		19.35	11.52	16.51	22.17	10.54	15.07
Huayuan							
GDP per capita	15,377	18,956	18,150	17,517	18,850	20,374	20,097
Growth rate (%)		23.28	(4.25)	(3.49)	7.61	8.08	(1.36)
Baojing							
GDP per capita	7,844	9,871	10,974	11,906	13,374	14,731	12,705
Growth rate (%)		25.84	11.17	8.49	12.33	10.15	(13.75)
Guzhang							
GDP per capita	5,119	6,332	7,061	8,301	10,086	11,820	13,406
Growth rate (%)		23.70%	11.51%	17.56%	21.50%	17.19%	13.42%
Xiangxi Prefecture							
GDP per capita	8,276	9,923	10,725	11,991	14,137	15,465	16,171
Growth rate (%)		19.90	8.08	11.80	17.90	9.39	4.57
Hunan							
GDP per capita	14,869	18,147	20,428	24,719	29,880	33,480	36,763
Growth rate (%)		22.05	12.57	21.01	20.88	12.05	9.81

( ) = negative value, GDP = gross domestic product.

Source: Statistical yearbooks of the project area (2007 to 2013) and Hunan province (2007 to 2013).

4. Operation of the expressway and improvement of local roads has promoted transport development by reducing travel time and cost. During project operation, the local government invested CNY50 million to build new bus stations and upgraded 10 local township stations, which significantly improved local transport conditions. As a result, the number of buses and cars within each county increased along the expressway alignment, contributing to the decrease in bus ticket prices and logistics cost due to increased competition and better road conditions. These have greatly benefited local communities, particularly the poor. For example, the public bus fee has decreased from CNY0.5/kilometer to CNY0.3/kilometer for rural farmers, which increased their mobility and economic activities. In addition, provincial and interprovincial trade in the region has increased because of the building and operation of the expressway, which reduced travel time and cost.

5. Operation of the expressway and improvement of local roads has also promoted tourism development in the project area by providing easier and better access to scenic areas and tourism resources, which in turn contributed to local economic development. The development of tourism has generated more job opportunities for local communities, contributing to their income, and providing more livelihood options. Since the project area is both geographically unique and culturally diverse and rich, local governments have taken measures to develop tourism resources by taking advantage of expressway transportation. They constructed

connecting roads from the expressway to scenic areas to attract travelers. For example, in 2013, the project area received 23.22 million tourists, a 23.2% increase over 2012. Total tourism revenue reached CNY14.49 billion in 2013, an increase of 37.5% over 2012.

## B. Poverty Reduction

6. Based on the 2006 social analysis, four of the 5 project counties and/or districts in Xiangxi Prefecture are nationally designated key poverty counties. Jishou is a provincial poverty county. The rural poverty incidence of the project area was high at 30%. In 2006, the area's per capita rural income was CNY1,962. About 600 of 1,381 villages are key poverty villages. Minorities make up almost 100% of the total population of these villages. With the socioeconomic growth in the project area and the increased fiscal revenue of local governments, living standards and income of local residents have improved. Local governments undertook poverty reduction interventions with increased access to microcredit for poor households. The statistics show that in 2013, total fiscal revenue reached CNY5.02 billion with an annual increase of 4.8%. Of this, public budget revenue reached CNY3.32 billion with an annual increase of 17.4%. Total fiscal expenditure was CNY17.05 billion, with an annual increase of 13.5%, among which the people's livelihood fiscal expenditure accounted for 64.6%. From 2007 to 2013, annual rural per capita income of farmers increased significantly from CNY2,255 to CNY5,260 (Table A12.2).

**Table A12.2: Per Capita Annual Net Income of Rural Residents in the Project Area (CNY/person)**

County	2007	2008	2009	2010	2011	2012	2013
Jishou	2,778	2,983	3,307	3,687	4,162	4,831	6,269
Fenghuang	2,280	2,773	3,145	3,460	4,012	4,569	5,733
Huayuan	2,292	2,705	2,980	3,290	3,783	4,354	4,903
Baojing	2,237	2,539	2,796	3,228	3,705	4,191	5,482
Guzhang	1,943	2,148	2,381	2,620	3,086	3,596	4,127
Xiangxi Prefecture	2,255	2,574	2,858	3,173	3,675	4,229	5,260

Sources: Statistical yearbooks of the project area (2007 to 2013) and Hunan province (2007 to 2013).

7. In 2010, the project area had 0.87 million rural poor residents according to the previous national poverty line (CNY1274); poverty incidence was around 30.7%, accounting for 60% of the total poverty population in Hunan province. In 2011, the central government raised the national poverty line to CNY2,300 in terms of the annual net income of farmers, up more than 80% from the CNY1,274 standard in 2010. With the new poverty line, an additional 0.62 million rural farmers were made eligible for government antipoverty subsidies, which increased the total poor population of the project area to 1.50 million, more than 50% of the total population. While the poor population increased, more of the low-income rural population was covered by the antipoverty subsidies, which enabled them to benefit from the antipoverty policy and regional economic development. The statistics show that the annual rural per capita income of farmers in the project area increased by 133% from 2007 to 2013. In 2012, the government targeted moving 100,000 people out of poverty, including 6,000 in Jishou, 12,000 in Fenghuang, 8,000 in Guzhang, and 14,000 in both Huayuan and Baojing counties. Based on the 2012 national economic and social development statistics, 22,000 people were lifted out of poverty in Fenghuang county and 6,300 in Jishou, exceeding the poverty reduction target. By the end of 2013, poverty incidence in the project area decreased to around 15.5% using the old poverty

line based on data from the Bureau of Poverty Reduction and Development of Xiangxi Prefecture. The expressway and local road network covering 52 poor villages will continue to contribute significantly to local government ongoing poverty reduction efforts by improving the mobility of the rural poor and their access to economic opportunities.

### C. Labor and Employment

8. According to the project completion report, 3,826 local laborers were directly employed in expressway construction along the alignment. In addition, locally procured construction materials and supplies—including 36,000 tons of steel, 917,000 tons of cement, 25,000 cubic meters of timber, 5.22 million cubic meters of sand and stone, and 220,000 tons of gasoline and diesel stimulated local economic development. The project also provided many employment opportunities in the project area. During operation, 315 people were recruited to work for toll services and road administration, and 45 as cleaners and security guards. These jobs were mostly provided to local villagers including ethnic minorities, most from poor families in surrounding areas. For example, Jicha Expressway Administration Bureau hired 194 local residents, including 74 women and 50 ethnic minorities. A total of 4,225 affected people were trained and employed indirectly.

### D. Awareness and Prevention of HIV/AIDS

9. Although HIV incidence reported by Hunan province is low, the project contractors and Jicha Expressway Construction and Development Company undertook joint efforts to promote awareness of HIV/AIDS prevention for local residents with assistance from local disease control centers. HIV/AIDS prevention posters were placed in villages and township communities along the expressway. According to the fourth socioeconomic monitoring report prepared by Hunan University in April 2012, 80% of interviewed villagers reported having basic knowledge of AIDS prevention (Table A12.4). Moreover, local governments organized effective prevention programs in remote villages and technical assistance in this field was conducted.

**Table A12.4: HIV/AIDS Knowledge of Rural Women from Surveyed Counties**

County	Participants	AIDS Knowledge		Prevention Knowledge		Precautions
Huayuan	45	Good	80%	Learned	100%	Using condoms
		Limited	20%			
Jishou	50	Good	85%	Learned	100%	Using condoms
		Limited	15%			

Source: Fourth Socioeconomic Monitoring Report prepared by Hunan University in 2012.

### E. Gender Development

10. Given the fact that the preference for boys, rather than girls, is very common in the project area, the operation of the expressway and improved local roads has promoted gender awareness in the area through better information access and understanding of gender issues. With improved road access, women have benefited from increased marketing opportunities, better access to education and health facilities, and improved engagement in social activities and career development. Furthermore, the improved road conditions have enabled local women living in remote mountainous areas to access medical services. According to the statistics, more women chose to deliver their babies in hospitals because of better road conditions. The hospital

delivery rate increased from 92% in 2005 to 99% in 2012 in the project area. In addition, women in rural villages are encouraged to deliver babies in hospitals with local governments providing a delivery subsidy (CNY100–CNY150).

## **F. Ethnic Minority Development**

11. The project area covers one city and four counties in ethnic minority areas, and has 439,400 ethnic minorities including Miao and Tujia as the two major groups, accounting for 79% of the total population. About 60% of the ethnic population have benefited from the project. The ethnic development plan was to ensure that adverse impacts of the project could be mitigated and local communities would benefit from the project in a culturally appropriate way. The isolated minorities and rural poor have benefited from the improved village roads with better access to economic opportunities and public service. With government investment, new bus stations were built and local township stations upgraded, significantly improving the transportation conditions with reduced travel time and cost. Hunan University was recruited as the monitoring agency and, based on the four monitoring reports submitted, did not find any adverse impacts during implementation. The impact of resettlement is discussed in Appendix 11.

12. Overall implementation of the ethnic minority development plan was effective and efficient, and integrated well with government support programs. Various government poverty reduction interventions were developed and implemented in the project area to improve the living standards of local ethnic minority groups. Based on the Hunan Province Poverty Alleviation 2001–2010 Plan, most affected ethnic minority villages in the project area were targeted as key poverty villages. The government provided up to 1 million poverty alleviation funds to each village from 2005 with implementation of the poverty reduction and development plan. Sixty percent of the funds was provided in loans to households of the villages, contributing significantly to poverty reduction and sustainable development of the affected villages.

13. Priority was given to local residents in construction-related employment, and skills development training was organized for those adversely affected by resettlement. According to the project completion report, 3,826 local laborers were directly employed in expressway construction along the alignment, in which 40% were ethnic minorities from Miao and Tujia. For example, in Guzhang county, 615 were employed during the construction, including 369 Tujia and 246 Miao ethnic minorities. In addition, local governments provided skills development training to villagers to promote income generation activities including crop farming, livestock breeding, and tourism management. A total of 1,520 ethnic minorities were trained on agricultural technologies, in which 1,130 trainees were provided with job opportunities.

14. Awareness and prevention programs were conducted to educate and protect ethnic minority populations from the spread of HIV/AIDS and other sexually transmitted diseases. Twenty-eight health clinics were built near construction camps and local communities. HIV and sexually transmitted disease education programs were broadcast through popular media channels four times every year. A total of 510 HIV/AIDS prevention posters were placed in affected areas with assistance from the local centers for disease control and prevention. In addition, prevention education using films and videos was provided, and many clinics were opened along the alignment.

15. Township governments and associated institutions conducted other activities and programs to strengthen the project benefits for local ethnic minorities, including road and traffic safety awareness, and tourism development and promotion. Based on the project completion

report, local ethnic minorities benefited from the increased tourism through direct employment, locally produced tourism items, and opportunities for establishing small business.

**G. Lessons and Recommendations**

16. Since the project area has a concentration of poverty with many ethnic minorities, the following may be considered to ensure that local residents enjoy benefits that accrued from the project in the long term: (i) generate more livelihood restoration programs to improve farmers' lives by providing more practical and tailored training, especially for middle-aged and older rural residents; (ii) strengthen the government's complementary poverty reduction plan and rural social safety net; and (iii) prioritize employment opportunities in road maintenance to local ethnic minorities, especially women.

## ENVIRONMENTAL IMPACT ANALYSIS

1. The Hunan Roads III Development Project constructed a 65.346-kilometer (km) four-lane controlled-access expressway from Jishou to Chadong and upgraded 130.22 km of two local roads in the western area of Hunan province. In line with the Environmental Policy<sup>1</sup> and Environmental Assessment Guidelines of the Asian Development Bank (ADB), the project was classified environment category A.
  
2. The summary environmental impact assessment (SEIA) report, circulated to ADB in May 2005, is based on information contained in the environmental impact assessment (EIA) report for the project's expressway components prepared by the Highway Research Institute of the Ministry of Communications on behalf of the Hunan Provincial Transport Department, and the initial environmental examination for the local road component prepared under technical assistance.<sup>2</sup> The SEIA concludes that the environmental impacts of the project would be minimized to acceptable levels by implementing credible and timely environmental mitigation and monitoring programs as stipulated in the environmental management plan (EMP). The EIA and initial environmental examination were prepared using methodologies and standards consistent with relevant guidelines established by the State Environmental Protection Administration (former Ministry of Environmental Protection) and Ministry of Communication of the People's Republic of China (PRC), as well as in compliance with applicable laws and regulations. The State Environmental Protection Administration approved the EIA report in August 2005; the Ministry of Water Resources approved the Soil Erosion Protection Plan (SEPP) in September 2005.
  
3. The Hunan Provincial Water Resource Department will conduct the completion technical review for the SEPP of the expressway in October 2014. Government approval of the SEPP is expected at the end of 2014. The Ministry of Environmental Protection will undertake the completion technical review for environmental protection of the expressway in August 2014. The completion technical reviews of soil erosion and environment protection for local roads will be conducted in 2015.

### A. Environmental Protection and Management

4. Jicha Expressway Construction and Development Company (JECC), the implementing agency for the project expressway, and Xiangxi Autonomous Prefecture Transportation Bureau, the implementing agency for local roads under the project, were responsible for coordinating environmental management under the project. JECC established the environmental and resettlement management office to oversee EMP implementation with the consultant's assistance and to deal with environment issues involving contractors and local communities. Each contractor's office has a designated environment engineer responsible for verification of effects on the environment during construction and the defect liability period, and taking effective measures to mitigate adverse impacts on the environment. Environmental and soil erosion control specification clauses were included in the contract signed by the implementing agencies and contractors during construction. Guidelines were set for the acquisition of temporary occupied land, and transportation and storage of waste material.

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<sup>1</sup> Asian Development Bank. 2002. *Environmental Policy of the Asian Development Bank*. Manila.

<sup>2</sup> ADB. 2005. *Technical Assistance to the People's Republic of China for Preparing the Hunan Roads Development III Project*. Manila.



5. During project preparation, including preliminary preparation and detailed design, the alignment of the project expressway was carefully screened, taking into account the ecological and socioeconomic environment. The engineering design was improved to minimize environment impacts. Appraisal estimates were that the cost of environmental protection and mitigation measures would be CNY47.865 million. According to JECC's project completion report, the actual investment for environmental protection was CNY193 million, 3.42% of the total investment, which included slope stabilization, ecological rehabilitation, spoil sites revegetation, soil and water conservation measures.

## **B. Environmental Monitoring**

6. Contractors and construction supervision companies provided daily on-site environmental monitoring; the environment monitoring specialist conducted periodic environmental monitoring tasks, taking samples for analysis in accordance with the EMP monitoring procedures and guidelines.

7. During project implementation, JECC engaged a qualified supervision entity, Hunan Soil and Water Conservation Monitoring Station, to supervise SEPP implementation. Hunan Province Communication Environmental Protection Monitoring Centre was engaged as the external environmental monitoring agency by the project management office to verify the environmental impacts of the construction. The noise, air, and surface quality have been monitored at designated sites according to the environmental monitoring plan in the SEIA. Twenty environmental monitoring reports were prepared by Hunan Province Communication Environmental Protection Monitoring Centre and reported to the project management office. Four semiannual environmental monitoring reports were reported by the project management office to ADB and uploaded on the ADB website. During construction and project operation, the EMP and SEPP were implemented. The monitoring results show no significant environmental damage during project construction and operation.

## **C. Implementation of Mitigation Measures**

8. During implementation, environmental monitoring and mitigation measures were carried out according to the EMP and the SEPP. The following measures have minimized adverse environmental effects: (i) reusing 3,993,307 cubic meters of spoil from tunnels and other excavations for embankment filling, (ii) minimizing excavation and potential erosion by optimizing the design of bridge substructures, (iii) applying integrated revegetation and structural methods to recover 1,471,885 square meters of cutting slopes and embankments, (iv) rehabilitating 45 borrow pits and one spoil dump by using excavated topsoil, and (v) installing wastewater collection and treatment facilities in four toll stations and two service areas to reduce water pollution.

## **D. Environmental Impact**

### **1. Noise**

9. During construction, contractors used low-noise equipment and adopted mitigation measures to reduce noise at sensitive locations mentioned in the EIA. The SEIA identified 8 sites as having potential noise problems during operation. To mitigate the impacts, 2,586.8 meters of sound abatement barriers were installed at 17 sites.

## **2. Ambient Air Quality**

10. During construction, most 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. Monitoring activities have been conducted in particular for the 31 sensitive points identified in the SEIA. The monitoring results for vehicle emissions show that nitrogen dioxide is below the grade II limits of the national ambient air quality standards (GB3095–1996). Relevant standards for vehicle emissions and their enforcement were reported to ADB in 2012.

## **3. Surface and Ground Water**

11. During construction, adverse impacts on surface water were limited, caused mainly by siltation and waste from construction sites and workers' camps. All proposed mitigation measures have been undertaken appropriately. During operation, roadway runoff is diverted to the drainage system. Wastewater from toll and monitoring stations is collected and treated before discharge. Soil protection works are inspected regularly to ensure the network's good condition and effective functioning.

## **4. Solid Wastes**

12. During construction, 13,373,518 cubic meters of excavated materials were disposed of at 45 sites. The actual volume of disposal was 5 times more than the envisaged 2.42 million cubic meters, and the number of sites was more than 19 as per the SEPP. Six borrow pits were employed rather than the five identified at appraisal. The reason for this difference was the inadequate geological surveys of the mountainous Karst zone and inaccurate prediction about the excavation works during project preparation. However, the borrow pits and disposal sites were carefully reselected to minimize the number of sites, thus minimizing land disturbance. All disposal sites and borrow pits were restored and rehabilitated using retaining structures, drainage systems, and revegetation. During operation, solid waste production is minor. Cleaners appointed by Hunan Provincial Highway Administration Bureau are responsible for its collection and disposal according to local regulations.

## **5. Aizai Suspension Bridge**

13. As one of the largest suspension bridges in the world, careful consideration was given to the alignment and detailed design of the Aizai bridge to avoid negative impacts on the environment. After construction, the temporary access road was rehabilitated and handed over to the local government as a local road. To prevent soil erosion, a well-designed drainage system was constructed to channel the runoff from the bridge deck to a safe area to prevent spills from draining into the valley and communities below.

## **6. Ecological Environment**

14. During construction, contractors carried out environmental protection in accordance with environmental protection clauses stipulated in their contracts. All sites temporarily occupied during construction were restored. Cutting surfaces, subgrades, and embankment slopes were generally stabilized using appropriate vegetative and structural measures such as retaining walls, riprap, antiskid piles, rock bolts, and side ditches to prevent soil erosion. Spoil banks were covered with vegetation to control erosion. All access roads were rehabilitated and handed over

to local government as local roads. Revegetation along the access road was completed before hand over.

15. The project occupied 447 hectares permanently and 148 hectares temporarily. All land has been restored or compensated for. All targets for soil and water conservation have been met according to national regulations.

## **7. Road Safety and Maintenance**

16. The safety implementation plan was submitted to ADB and road safety audits were conducted during project design and construction. The road safety management measures have proven effective with a significantly reduced number of road crashes on the project expressway and on the project area. When the project expressway was opened to traffic, the Hunan Provincial Expressway Administration Bureau became responsible for operation and maintenance.

## **E. Conclusion**

17. During construction, all contractors fulfilled their obligations to protect the environment and implement mitigation in their construction schemes. The adverse effects of project construction in the surrounding environment were thus minimized. No rare natural resources were affected by the project. During operation, impacts on the ambient environment are minor and within the SEIA scope.