



Completion Report

Project Number: 30424
Loan Number: 1838
July 2010

People's Republic of China: Shaanxi Roads Development Project

Asian Development Bank

CURRENCY EQUIVALENTS

Currency Unit – yuan (CNY)

		At Appraisal	At Project Completion
		31 July 2001	2 February 2010
CNY1.00	=	\$0.1208	\$0.1465
\$1.00	=	CNY8.2769	CNY6.8274

ABBREVIATIONS

ADB	–	Asian Development Bank
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
FIRR	–	financial internal rate of return
GDP	–	gross domestic product
ICB	–	international competitive bidding
M&E	–	monitoring and evaluation
MOT	–	Ministry of Transportation
NCB	–	national competitive bidding
NTHS	–	national trunk highway system
O&M	–	operation and maintenance
PCR	–	project completion report
PRC	–	People's Republic of China
SASS	–	Shaanxi Academy of Social Science
SPCD	–	Shaanxi Provincial Communications Department
SPG	–	Shaanxi Provincial Government
SPTD	–	Shaanxi Provincial Transportation Department
SXEC	–	Shaanxi Xiyu Expressway Company
TA	–	technical assistance
VOC	–	vehicle operating cost
WACC	–	weighted average cost of capital

WEIGHTS AND MEASURES

km	–	kilometer
km/h	–	kilometer per hour
m ²	–	square meter
<i>mu</i>	–	Chinese unit of measurement (1 mu = 666.67 m ²)
pcu	–	passenger car unit

NOTES

- (i) The fiscal year (FY) of the government ends on 31 December.
- (ii) In this report, "\$" refers to US dollars.

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BASIC DATA

A. Loan Identification

1.	Country	People's Republic of China
2.	Loan Number	1838
3.	Project Title	Shaanxi Roads Development Project
4.	Borrower	People's Republic of China
5.	Executing Agency	Shaanxi Provincial Communications Department
6.	Amount of Loan	\$250 million
7.	Project Completion Report Number	PRC 1166

B. Loan Data

1.	Appraisal	
	– Date Started	19 February 2001
	– Date Completed	1 March 2001
2.	Loan Negotiations	
	– Date Started	13 July 2001
	– Date Completed	16 July 2001
3.	Date of Board Approval	30 August 2001
4.	Date of Loan Agreement	10 June 2002
5.	Date of Loan Effectiveness	
	– In Loan Agreement	8 September 2002
	– Actual	8 November 2002
	– Number of Extensions	1
6.	Closing Date	
	– In Loan Agreement	31 March 2006
	– Actual	7 January 2010
	– Number of Extensions	4
7.	Terms of Loan	
	– Interest Rate	ADB's London interbank offered rate (LIBOR)-based
	– Maturity	24 years
	– Grace Period	4 years
8.	Terms of Relending	
	– Interest Rate	ADB's London interbank offered rate (LIBOR)-based
	– Maturity	24 years
	– Grace Period	4 years
	– Second-Step Borrower	Shaanxi Provincial Government

9. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
8 November 2002	28 October 2009	83 months
Effective Date	Original Closing Date	Time Interval
8 November 2002	31 March 2006	41 months

b. Amount (\$ million)

Category	Original Allocation	Last Revised Allocation	Amount Canceled	Amount Disbursed	Undisbursed Balance
1. Civil Works	174.00	211.50	1.54	209.96	1.54
2. Equipment	22.60	8.77	0.00	8.77	0.00
3. Consulting Services and Training	2.10	1.65	0.00	1.65	0.00
4. Front-end Fee	2.50	2.50	0.00	2.50	0.00
5. Interest and Commitment Charges	24.00	25.58	0.00	25.58	0.00
6. Unallocated	24.80	0.00	0.00	0.00	0.00
Total	250.00	250.00	1.54	248.46	1.54

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department

C. Project Data

1. Project Cost (\$ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	312.00	248.46
Local Currency Cost	445.00	717.04
Total	757.00	965.50

2. Financing Plan (\$ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	512.50	693.91
ADB Financed	198.70	220.38
Other External Financing	0.00	0.00
Total	711.20	914.29
IDC Costs		
Borrower Financed	19.30	23.13
ADB Financed	26.50	28.08
Other External Financing	0.00	0.00
Total	45.80	51.21

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

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department.

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

Component	Appraisal Estimate	Actual
A. Base Cost		
1. Expressway Civil Works	448.70	622.69
2. Equipment	25.10	13.74
3. Land Acquisition and Resettlement	75.00	93.74
4. Consulting Services and Training	15.90	19.46
5. Local Roads	57.20	164.66
Subtotal (A)	621.90	914.29
B. Contingencies		
1. Physical Contingencies	49.70	0.00
2. Price Contingencies	39.60	0.00
Subtotal (B)	89.30	0.00
C. Front-End Fee	2.50	2.50
D. Interest and Commitment Charges During Construction	43.30	48.71
Total	757.00	965.50

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department.

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	June–July 2002	November 2002
Completion of Detailed Designs	December 2000	July 2002
Civil Works Contract		
Date of Award	July 2002	December 2002
Completion of Work	September 2005	September 2005
Equipment and Supplies		
First Procurement	May 2003	29 May 2005
Last Procurement	May 2003	15 June 2008
Completion of Equipment Installation	September 2005	December 2008
Start of Operations		
Beginning Operation of Expressway	December 2005	November 2005
Completion of Local Roads	December 2005	July 2009

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department.

5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From 31 December 2001 to 31 December 2002	Satisfactory	Unsatisfactory ^a
From 1 January 2003 to 31 December 2003	Satisfactory	Satisfactory
From 1 January 2004 to 31 December 2004	Satisfactory	Satisfactory
From 1 January 2005 to 31 December 2005	Satisfactory	Satisfactory
From 1 January 2006 to 31 December 2006	Satisfactory	Satisfactory
From 1 January 2007 to 31 December 2007	Satisfactory	Satisfactory
From 1 January 2008 to 31 October 2008	Satisfactory	Satisfactory
From 1 November 2008 to 31 March 2009	Satisfactory	Partly Satisfactory ^b
From 1 April 2009 to 31 July 2009	Satisfactory	Satisfactory

^a Two *unsatisfactory* ratings were due to a 7-month delay in loan signing and delay of loan effectiveness.

^b *Partly satisfactory* rating was due to a delay in implementation to allow processing of a major change in scope which was approved in July 2008 and the rating was overridden with the approval of major change in scope.

Source: Asian Development Bank.

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members^a
Fact-Finding	27 November–7 December 2000	7	50	a, b, c, d, e, f, g
Appraisal	19 February–1 March 2001	8	62	a, b, c, d, e, f, g, h
Inception	13–17 May 2002	2	10	a, i
Review 1 ^b	8–14 October 2003	4	27	a, i
Review 2	25–29 October 2004	2	10	a, i
Review 3 ^c	5 November 2005	2	2	a
Midterm Review	26–30 December 2005	6	44	a, e, i, j, l, m
Review 4	18–19 December 2006	2	2	a
Review 5	2–8 November 2007	4	21	a, j, k, e
Review 6	25–28 November 2008	2	8	a, i
Project Completion Review ^d	26 January–2 February 2010	4	28	a, i, l, m

^a a - engineer, b - financial analyst, c - economist, d - program officer, e - environment officer, f - social specialist, g - poverty specialist, h - counsel, i - assistant project analyst, j - staff consultant, k - resettlement officer, l - finance management officer, m – resettlement officer.

^b The project was transferred to the Asian Development Bank resident mission in the People's Republic of China for administration on 1 January 2004.

^c The review was in conjunction with consultation mission with the Shaanxi Provincial Government.

^d The project completion review mission consisted of W. Zhang, senior project officer and mission leader; F. Wang, finance management officer; W. Zhu, resettlement officer; and H. Hao, assistant project analyst.

Source: Asian Development Bank.

I. PROJECT DESCRIPTION

1. Economic growth in the People's Republic of China (PRC) since the 1980s has substantially increased demands for transport infrastructure. The structural change in the economy and efforts to reduce imbalanced developments between coastal provinces and hinterland regions have generated strong demands to allow least-cost and direct flow of freight, passengers, capital, and information. To cope with these demands, the government initiated a long-term strategy in 1988 to implement a 35,000 kilometer (km) national trunk highway system (NTHS). By 2004, this strategy has further evolved into a national expressway network plan with a total length of 85,000 km to be completed by 2020. When the expressway network is complete, all major economic centers and municipalities will be connected by expressway supplemented with local road networks. Asian Development Bank (ADB) assistance in the road sector supports the government's effort to expand and improve the national and local roads network. To meet growing demands for improved transport infrastructure and services, about CNY4,700 billion from government budget, domestic funds, and external sources were allocated for building new roads and improving the deteriorated highway network from 2001 to 2009. As of the end of 2008, the total length of the PRC's road network was 3.73 million km, consisting of 60,302 km of expressway, 54,216 km of class I highway, 285,200 km of class II highway, 374,200 km of class III highway, 2,004,600 km of class IV highway, and 951,600 km of under class highway. However, the PRC's road network density is about 38.9 km per 100 square kilometers (km²), which is about half that of the United States or about one-tenth that of Japan. The government's policy for the road sector, as reflected in its 11th five year plan for 2006–2010, called for (i) constructing 380,000 km of new roads to expand the total road network to about 4.0 million km; (ii) building 25,000 km of expressway so that the total length of expressway will be 65,000 km by 2010; (iii) completing 35,000 km of the NTHS by 2007; (iv) completing 18,000 km of interprovincial western development corridors by 2010; and (v) completing most sections of the national expressway network by 2010.

2. Shaanxi Province is a relatively poor interior region in western PRC. In 2000 the per capita gross domestic product (GDP) of the province was about two-thirds the national average. Shaanxi had limited road links with neighboring provinces and local transport, and through traffic was seriously constrained. Passenger and freight volumes carried by roads in Shaanxi were about one-third compared with those of coastal provinces of similar size or population. The project involves building a better road system in northeastern Shaanxi. The project area is largely rural, and its population is dependent on rain-fed agriculture. There are 3.8 million people in the project area, of whom 355,000 (9%) earn less than CNY1,000 per capita per annum; about 2.8 million (74%) earn less than CNY2,000 per capita per annum. The expressway is part of the NTHS. The project also includes upgrading local roads connected with the expressway.

3. The main objective of the project is to accelerate economic development and thereby reduce poverty in Shaanxi Province. The project was designed to (i) improve access of agricultural and industrial products to markets; (ii) improve access of the rural population to economic opportunities, employment, and social services; (iii) attract investment by lowering transport costs in the project area; and (iv) reduce congestion and accidents on existing roads. The project also supported sector reforms relating to road safety, vehicle emissions, and corporatization of expressway operations. The project framework is in Appendix 1.

4. In 1997, a feasibility study for the project was carried out by the Shaanxi Provincial Communications Department¹(SPCD) and approved by the government in 2001. ADB approved project preparatory technical assistance (TA) in August 1999 to review and assess the project's technical feasibility and financial viability, including the environmental impact and resettlement matters. These were completed in October 2000 and the TA outcome confirmed the technical, financial, and economic viability of the project, and the adequacy of the environmental and social measures to be implemented under the project. Subsequently, fact-finding and appraisal missions verified that the project was in line with ADB's country strategy² and sector policy. ADB's Board of Directors approved a loan for \$250 million for the project on 30 August 2001. The loan became effective on 8 November 2002 and had an original closing date of 31 March 2006. The closing date was extended to 30 September 2007 to enable the overseas training and procurement of maintenance equipment, and was further extended to 31 March 2008, 31 July 2008, and then 31 July 2009 to implement upgrading of an additional 70 local roads. Appendix 2 provides a chronology of major events.

5. At appraisal, the project comprised (i) civil works for the construction of about 176 km of a four-lane, access-controlled toll expressway between Yumenkou and Yanliang, including interchanges with toll stations, connecting roads, bridges, administrative stations, and service areas; (ii) improvement of about 1,605 km of local roads³ servicing poor counties and townships; (iii) procurement of equipment for maintenance and management, toll collection, communications, construction quality control, traffic monitoring, and road safety; (iv) land acquisition and resettlement; and (v) consulting services for construction supervision, monitoring and evaluation, and overseas training.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

6. ADB's country strategy at the time of appraisal called for (i) construction of expressways and highways that connect major growth centers and promote linkages with hinterland economies; (ii) integration of the network so that the NTHS is supported by a system of feeder roads, particularly those that provide access to poor areas; (iii) promotion of road safety; (iv) further institutional strengthening to increase the commercial orientation and efficiency of expressway organizations; (v) improvement of highway planning and evaluation techniques; (vi) adoption of appropriate pricing policies to ensure optimum use of road transport capacity; and (vii) use of alternative methods of investment financing, including private sector participation. The project was designed to support the strategy by building part of the NTHS in Shaanxi Province and would improve the access of Xi'an and other cities in the western provinces to Beijing and the eastern and southern seaports. The main features of the project included (i) improving access of agricultural and industrial products to markets; (ii) improving access of the rural population to economic opportunities, employment, and social services; (iii) attracting investment by lowering transport costs in the project area; and (iv) reducing congestion and accidents on existing roads. The project also included institutional capacity building for

¹ The Shaanxi Provincial Communications Department (SPCD) was renamed the Shaanxi Provincial Transportation Department (SPTD) on 10 March 2009, and SPTD inherited all responsibilities of the SPCD. In this report, SPTD is used.

² ADB, 2001, *People's Republic of China: Country Strategy and Program Update (2002-2004)*. Manila.

³ The local roads component at appraisal included 30 local roads with a total length of 627 km. Inclusion of the upgrade of an additional 70 local roads totaling 978 km under the project scope was approved on 25 July 2008. The actual total length of completed local roads is 1,605 km.

expressway operation and maintenance. The project is consistent with ADB's country operational strategy.

B. Project Outputs

1. Expressway

7. At appraisal, the expressway was planned as a 176-km four-lane, access-controlled toll expressway. Expressway civil works commenced in December 2002, about 12 months behind the original schedule due to delayed loan effectiveness. The expressway was completed in September 2005 as per the appraisal schedule. The construction period was shortened by about 12 months by effective and efficient project management and administration, and utilizing advanced construction technologies and new materials. Civil works were implemented through 19 packages, of which 15 were under ADB financing. All civil works packages—which included 22 super large and large bridges, 16 medium-sized bridges, 10 small bridges, 394 culverts, 10 fully fledged interchanges, 47 separated interchanges, 291 underpasses, 74 flyover bridges, 10 toll stations, 3 administration branch offices, drainage systems, protection works, landscaping, and traffic safety components—were completed and accepted by the SPTD in October 2005. Building and ancillary facilities were implemented from November 2003 to October 2007. Four interchanges and nine underpasses were added to the expressway's original design to provide more access to local road users. The expressway was opened to traffic on a trial basis on 27 November 2005.

8. The expressway was observed to be of good quality. The Ministry of Transportation (MOT) concluded with a quality rating of *excellent* after a project completion acceptance inspection mission of the expressway in October 2008. Based on the MOT's acceptance review, the expressway pavement has reached an international roughness index of 1.265 millimeters per meter (mm/m).⁴ The interchanges were well constructed and provided convenient links with local road networks. The expressway facilities were well maintained. Weight-based toll facilities were installed and operated at all entrances and exits. As of January 2010, truck overloading incidents were below 1%, compared with widespread overloading before 2005. The slopes were protected by a combination of retaining walls and open graded sloping with grass or plants. Plantation and environmental protection measures were integrated with the natural terrain. Traffic safety signboards provided explicit guidance to road users and rumble strips were installed on long straight, curved, or long sloping sections. Solid sound abatement walls were installed at the sections close to schools and residential areas. Safety guardrails were well aligned and provided seamless protection.

2. Local Roads

9. At appraisal, the local road component—30 road sections in Weinan Municipality consisting of improvements to 67 km of class II roads and 560 km of class III and IV roads—was included in the project. Improvement of these 627 km of local roads started in 2004; most local roads were improved in 2005 and 2006 and the rest were completed in 2007.

10. To enhance the project objectives, the borrower requested a change in project scope. This change in scope included (i) increasing the local roads component to include upgrading of

⁴ The international roughness index was developed by the World Bank in the 1980s. It is a scale for roughness based on the simulated response of a generic motor vehicle to the roughness in a single wheel path of the road surface. According to the Federal Highway Administration of United States, pavements with an index of 1.5 mm/m are categorized as *good*.

an additional 70 rural roads (978 km); (ii) reallocating unutilized \$20.8 million from the contingency category, \$13.1 million from the equipment category, and \$0.45 million from the consulting services and training category to the local roads subcategory; and (iii) adjusting ADB financing for the improvement of local roads component from 18% to 55%. ADB Management approved the borrower's request in July 2008.

11. Among these 70 local roads, 51 road sections were in Weinan Municipality (13.6 km of class II roads, 225.9 km of class III roads, and 363.3 km of class IV roads), six road sections were in Tongchuan Municipality (97.0 km of class IV roads), and 13 road sections were in Yan'an Municipality (11.0 km of class II roads and 267.8 km of class IV roads). Improvement of these local roads was implemented over a 12-month period from August 2008 to July 2009. These improved local roads were upgraded to appropriate technical standards with either asphalt or cement concrete pavement within the original right of way. Public transport services were extended to rural villages via these improved roads and local governments set favorable fiscal incentives to motivate rural bus operators. In Weinan Municipality, regular rural bus services covered 100.0% of townships and 95.1% of administrative villages, while Yan'an and Tongchuan municipalities have provided similar rural bus service coverage. Local government and townships established a practical local roads maintenance mechanism and village stakeholders showed very strong ownership of operation and maintenance of the rural roads. Also, cash payments were provided to more than 1,000 rural farmers who undertook part-time routine road cleaning tasks. The list of completed local roads is included in the contract packaging details (para. 24).

3. Equipment

12. The component consisted of equipment for (i) toll collection, traffic monitoring, and communications; (ii) road maintenance, vehicle weighbridges, and safety; and (iii) inspection, testing, and office administration. They were procured through international competitive bidding (ICB).

13. Equipment packages, including toll systems, snow sweepers, and cleaning, testing and maintenance vehicles, were procured, supplied, and installed in 2005 and 2006. The remaining packages, including multifunction road test vehicles and road hot patch vehicles, were supplied and installed by mid-2008. Slower procurement of some packages was caused by lengthy domestic procedures. It was deemed that there were no adverse impacts because these items of equipment were to be used during the full operation period. Currently, all equipment is fully operational. The total cost of equipment financed by loan proceeds was reduced from \$22.6 million (appraised) to \$8.8 million (actual). The estimated cost for 11 equipment packages was close to the actual cost, while the toll collection and monitoring system had about \$13.6 million in savings. The main reason for the cost savings was significant development in information technology (IT) which contributed to much lower equipment cost and the application of a province-wide expressway network-based toll system in 2005. This enabled the project expressway to share the network-based IT infrastructure and cancel some unnecessary equipment.

4. Consulting Services and Training

14. An international consulting firm was engaged in accordance with ADB's Guidelines on the Use of Consultants (2007, as amended from time to time) to provide 44 person-months of consulting services to (i) assist with project management over the entire construction period; (ii) provide expertise in bridge construction; (iii) conduct a safety audit of the project design and

make recommendations on improving the safety of completed construction works; (iv) help set up and implement quality control procedures; (v) assist in formulating a human resource development and training program; and (vi) help establish and implement a project performance management system, including assessing the impact on poverty reduction. The international consultant was fielded in April 2003 and their services ended in November 2005 with an actual input of about 30 person-months. In addition, 7,200 person-months of national consulting services from 10 domestic supervision firms were also engaged using local procurement procedures acceptable to ADB. There were 10 resident engineer offices and two center laboratories staffed with a total of 269 engineers and technical professionals. The international and national consultants worked closely in the areas of contract management, road safety, materials testing, quality control, environment protection, and monitoring. The local roads are supervised by local highway administration units under the overall guidance of the SPTD. The Shaanxi Provincial Social Science Academy was hired as the external monitor for resettlement and social impact of the expressway. Chang'an University was engaged as external monitor for the local roads.

15. The Shaanxi Xiyu Expressway Company (SXC) developed a corporate strategy and a human resource development plan on expressway construction and management. The plan included domestic and overseas training. International consultants provided six domestic trainings in the fields of construction supervision, operation and maintenance, material testing, pavement construction, and foundation settlement control. An overseas training program included expressway operation and maintenance, commercial development of expressways, operation and business planning, road safety, project management, highway planning, monitoring and evaluation, expressway emergency operations, and traffic enforcement. A total of 33 person-months of international trainings were conducted. All trainings were smoothly carried out. Each training group submitted a training report after training. Knowledge learnt was disseminated within the executing agency and agencies concerned.

C. Project Costs

16. The actual total project cost⁵ was \$965.50 million, which was \$208.50 million higher than the appraisal estimate. By excluding factors pertaining to appreciation of the local currency of about 18% from 2006, the actual cost for the expressway denominated in local currency was lower than estimated, i.e., CNY4.34 billion (appraisal)⁶ compared to CNY4.25 billion (actual). The cost for local roads, due to scope change, was increased from CNY473.6 million (appraised) to CNY1.12 billion (actual). Local road improvement was increased from 627 km at appraisal to 1,605 km at completion. A few expressway civil works packages incurred some major variations due to geotechnical difficulties and design changes. The original allocated physical contingencies were able to fully satisfy those variations. It was assessed that the project cost was basically well under control.

17. At appraisal, ADB financing was \$250.00 million (about 33% of total project cost) to finance about 80% of the foreign exchange cost; Shaanxi Provincial Government (SPG) financing comprised the balance of the foreign exchange cost (\$62.0 million equivalent) and part of the local currency cost (\$119.0 million). The local currency cost of \$326.0 million equivalent was to be financed by subsidies from the MOT (about \$145.0 million), and a loan from the China Construction Bank (about \$181.0 million). Upon completion, the ADB loan of about \$248.46 million accounted for about 25.7% of actual project cost and 100% of the foreign exchange cost.

⁵ At appraisal, \$1.00 = CNY8.28. At project completion, \$1.00 = CNY6.83.

⁶ The cost estimate at appraisal included physical and price contingencies.

The local currency cost of about CNY3.62 billion (\$717.1 million) was financed through subsidies from the MOT (\$146.7 million) and the SPG (\$208.0 million), and a China Construction Bank loan (\$362.4 million). Counterpart funds for the project expressway and local roads improvement were available in accordance with the implementation schedule. The domestic funds were mobilized on time. Appendix 3 presents the project costs and financing plan.

D. Disbursements

18. Out of \$250 million loan proceeds, \$248.46 million was disbursed during 2002–2009. Three types of ADB disbursement procedures were used—reimbursement procedure for civil works, direct payment for consulting services, and commitment procedure for equipment. The disbursement control procedures were satisfactory. Among disbursed ADB loan proceeds, 67.7% were utilized for project expressway civil works, 3.5% for equipment, 0.7% for consulting services, 16.8% for local roads, and the balance was capitalized for interest during construction, commitment charges, and front-end fees. Actual interest during construction and commitment charges for ADB loan proceeds were \$48.71 million. The loan closing date was extended four times from 31 March 2006 at appraisal to the final 31 July 2009. The loan account was closed on 7 January 2010 and loan savings of \$1,537,217.92 were canceled at the same time. The projected and actual disbursements are in Appendix 4.

E. Project Schedule

19. The project was envisaged to be implemented over about 4 years from November 2001 to September 2005. The local road component was anticipated to be implemented concurrently with expressway construction. Expressway civil works commenced construction in December 2002, about 1 year late. By taking effective measures and with wide application of advanced technologies and new materials, the expressway was physically completed as scheduled. Most local roads under the original local road component were completed in 2005 and 2006, and a few were completed by 2007. The additional local roads were completed before July 2009. The appraised and actual project implementation schedule is in Appendix 5.

F. Implementation Arrangements

20. At appraisal, it was envisaged that the Shaanxi Provincial Transportation Department (SPTD) would be the executing agency overlooking the overall implementation of the project. Sxec is responsible for the implementation, operation, and maintenance of the project expressway. The Foreign Fund Financed Project Office of the SPTD is responsible for overall implementation of the local roads through local government agencies. Each municipality and its jurisdiction counties have established units with qualified staff to undertake implementation assignments. Operation and maintenance tasks of local roads were decentralized to county government agencies after completion. Each county has established a rural road maintenance office with appropriate staff and budget. Sxec's organizational structure during implementation was established, and included eight divisions administering four implementation units staffed with about 120 management and technical personnel. Most staff had experience in implementing road projects financed by international financial institutions. During the operation period of the expressway, Sxec shifted its organization into an operation and maintenance-oriented structure, which included four departments, one toll division subordinated with three administrative offices and 10 toll stations, and two maintenance centers and three service stations. Currently, Sxec has 920 staff, most of whom are toll collectors employed from project areas. The work of cleaning and maintaining of plantings for the project expressway were

provided to laborers from nearby villages and townships. The organization charts of the project are in Appendix 6.

G. Conditions and Covenants

21. No covenants were modified or waived during implementation. All loan covenants falling due were complied with or being complied with as of the end of January 2010. The financial ratio covenants for the project include (i) a debt–equity ratio of not more than 60:40, (ii) a working ratio of not more than 12% during project expressway operation, and (iii) a debt service coverage ratio of not less than 1.2 during project expressway operation from the first year of full operation. The projected financial statements indicated that SSEC would be able to comply with the working ratio and debt service coverage ratio starting from 2010, and the debt–equity ratio starting from 2013. Compliance with major loan covenants is presented in Appendix 7.

H. Related Technical Assistance

22. ADB provided project preparatory technical assistance (TA) for preparing the Shaanxi Roads Development Project.⁷ The TA was to (i) review and refine the government's feasibility studies and preliminary designs, including all technical, economic, and financial aspects for the project expressway, (ii) assist the provincial authority to identify a program of provincial, county, and village road improvements in the project area and measures to ensure safe and clean road transport operations, (iii) refine the environmental impact assessment (EIA) of the project and prepare a summary EIA in ADB's format, (iv) carry out a social impact analysis and assist the government in preparing a land acquisition and resettlement plan, and (v) review the institutional structure for trunk road investment and operations and explore alternative road investment financing sources. The TA had a total of 30 person-months of consulting services (16 person-months of international consultants and 14 person-months of national consultants). The TA was conducted on schedule and produced the required outcome. Subsequent loan processing was based on the TA findings and recommendations.

I. Consultant Recruitment and Procurement

23. **Consulting services.** International consultants financed by the loan were recruited in accordance with ADB's Guidelines on the Use of Consultants. An international consulting firm was engaged to provide international consulting services. ADB approved contract awards in November 2002. The international consultants were fielded in April 2003 and their services completed in November 2005. National consultants for design, construction supervision, and procurement were recruited following local procedures acceptable to ADB.

24. **Procurement.** Civil works for the expressway were divided into 19 contract packages, of which 15 were under ADB financing and procured using ICB in accordance with ADB's Procurement Guidelines (2007, as amended from time to time) while the other four were under domestic financing and procured through national competitive bidding (NCB) procedures. ADB approved contract awards for civil works in June 2002 and four NCB packages were contracted in September 2001. No major issues were encountered in the bidding and execution of the contracts. NCB and force account were used for improvement of local roads packages. Contracts for equipment financed by ADB were procured following ICB procedures. The expressway civil works, local roads, and equipment packages are shown in Appendix 8.

⁷ ADB. 1999. *Preparing the Shanxi and Shaanxi Roads Project*. Manila (\$640,000, approved on 30 August 1999).

J. Performance of Consultants, Contractors, and Suppliers

25. The international and national consulting firms engaged to assist in project implementation performed satisfactorily and established good working relationships with the SPTD and SEXEC. The international consultants organized an overseas training program in an efficient and effective manner. Well-designed presentations and site visits familiarized trainees from the SPTD and SEXEC with international practices on expressway design, construction, and management. The international consultants also provided expertise on environment protection and expressway safety measures, and helped integrate these measures into the project implementation. National consultants, working jointly with international consultants, provided satisfactory services to the project implementation.

26. The civil works contractors performed well and completed construction following the construction schedule with satisfactory quality. In October 2005, the SPTD carried out a project engineering acceptance mission for the expressway and evaluated its quality level as excellent. The domestic design institute was able to design the expressway by incorporating international prevailing practice. The civil works of the expressway, including bridges and pavement, were well implemented and were of satisfactory quality. Equipment for operation and maintenance was supplied, installed, and commissioned as scheduled. Environmental monitoring during the construction conducted by national consultants was satisfactory. The overall performance of the consultants, contractors, and suppliers was evaluated *satisfactory*.

K. Performance of the Borrower and the Executing Agency

27. The SPTD implemented the project in an efficient manner. Project management during the construction phase was evaluated *highly efficient*. The expressway construction and maintenance standards are evaluated as meeting international practices. SEXEC has sufficient capacity to manage Federation Internationale Des Ingenieurs-Conseils (FIDIC)-based contracts. Internal project controls were put in place to ensure effective use of funds. An internal auditing unit was established in SEXEC. Domestic funds were mobilized on time. Withdrawal applications were submitted on a timely basis and contractors were paid promptly. In general, land acquisition and resettlement activities were completed on time. The performances of the borrower, SPTD, and SEXEC were *satisfactory*.

L. Performance of the Asian Development Bank

28. ADB conducted regular loan review missions during project implementation and provided effective advice to the SPTD and SEXEC on project implementation and procurement matters. ADB processed procurement in an efficient manner. ADB also processed disbursement requests expeditiously and loan proceeds disbursements were timely. ADB swiftly responded to the SPTD's request to include additional local roads under the project scope and processed necessary management approval. The SPTD and SEXEC expressed satisfaction with the arrangement of transferring project administration responsibility to the ADB resident mission in the PRC, which facilitated closer and efficient communications. There had been no safeguard supervision missions until the project was handed over to the resident mission, which was able to monitor social safeguards regularly, although by then the resettlement activities for the expressway had nearly been completed. ADB's performance during project implementation was *satisfactory*.

III. EVALUATION OF PERFORMANCE

A. Relevance

29. The project was assessed *highly relevant*. The project is located in the northeastern part of Shaanxi Province and is the government's top priority project of the NTHS, connecting the western provinces with Beijing and coastal provinces. The goal of the project is to support poor economic and social development by (i) increasing incomes and reducing poverty in Shaanxi Province through improving access of industrial and agricultural enterprises to markets; (ii) improving access of the rural population, including those living in poverty counties, to market opportunities and social services; (iii) attracting investment by lowering transport costs in the project area; and (iv) reducing congestion and accidents on existing roads. The project is also in line with ADB's past and present operational strategy for the PRC road sector, i.e., the construction of highways that connect major growth centers and establish links with hinterland communities; capacity building to improve management efficiency and enhance commercial operation; improvement of highway design; and promotion of road safety, private sector participation, and network integration. The project has contributed both to the expansion of the expressway network in Shaanxi Province from 543 km in 2001 to 1,646 km in 2006 and 2,770 km in 2009, and to the interconnection of villages and counties with all-weather roads in the province. By the end of 2009, there were about 127,000 km of rural roads in Shaanxi and 99% of townships and administrative villages were connected with all-weather roads. Bus services covered 99% of townships and 87% of administrative villages. Shaanxi Province has achieved robust economic development, maintaining two-digit average GDP growth from 2001 to 2009. The project influence area's GDP growth rate was 14.3% in 2009 compared with the provincial growth of 13.7%. The higher growth rate in the project influence area confirmed the economic impacts of the project. Significant impacts in the area were also observed in growing investment, rapid urbanization, and booming service and secondary industries. Accelerated economic development and rapid transformation of the industry structure in the project influence areas led to improved living standards for residents and contributed to poverty reduction.

B. Effectiveness in Achieving Outcome

30. The project is evaluated *effective* because it (i) has contributed to an improved highway network for the nation and the region, (ii) effectively saves time (it has reduced the travel time from 4 hours to 2 hours between Xi'an and the provincial border) for the people living in the project area, (iii) is effective in both improving road safety and reducing vehicle emissions, and (iv) has contributed to strengthening the institutional capacity of the SPTD and SXEC for constructing expressways and local roads.

31. The project contributed to economic development and improved the living standards in the project areas by (i) shortening the traveling time to a 4-hour round-trip from Hancheng to Xi'an compared with 1 day previously; (ii) increasing economic, social, and cultural exchanges between local people and outsiders; (iii) boosting investments in industrial projects; (iv) attracting many tourists; (v) expanding the service sector including logistics, accommodation, restaurants, and commercial and retail services; (vi) accelerating urbanization in Weinan, Chengcheng, Dali, Hancheng, and the suburbs of Xi'an; (vii) integrating the local road network with the expressway; and (viii) providing a shorter and direct through-traffic route between Xi'an and Beijing and bolstering logistics development. The project has also made skills development opportunities more accessible to farmers and the poor, thus improving their employment options in towns and cities.

32. Appropriate safety measures were built for the expressway. A traffic surveillance system was installed at all toll stations and key locations along the expressway to monitor and provide real-time traffic information. In 2008, there were 19 accidents on the expressway and these accidents resulted in 17 fatalities and 13 injuries. In the same period, there were 28 accidents on the parallel national highway G108 and 14 on the provincial highway S106, with a total of 47 fatalities and 15 injuries. In terms of accidents versus ton-kilometer and passenger kilometer, it can be acknowledged that the accident rate on the expressway is much lower than on the parallel national and provincial highways. To ensure a better traffic safety environment, SXEC worked closely with traffic police to strengthen traffic safety standards by taking measures such as educating rural road users, daily regular safety patrolling, identifying potential black spots, establishing an emergency response system, and frequently consulting with local communities to disseminate traffic safety information. Vehicle emissions in the corridor were effectively reduced as a result of the transfer of traffic from national highway G108 to the project expressway, which shortened the traveling time by more than half between Hancheng and Xi'an. Without the expressway, national highway G108 and provincial highway S106 would become more congested, causing a significant reduction in travel speed and increasing vehicle emissions. Comparing emissions from vehicles on the project expressway with emissions from the same vehicles on the national highway in the without-expressway scenario (assuming traffic demand in this corridor remains flat), total vehicle carbon dioxide emissions are about 10% less in the with-expressway scenario.⁸ To ensure that vehicle emissions are within the limit, vehicles in Shaanxi Province are periodically verified through an emission certificate system.

33. SXEC was established as a separate company under the Company Law of the PRC and thus maintains its financial and management independence. This independence ensured strong accountability for the management of SXEC to implement the expressway efficiently and manage the expressway effectively. SXEC acquired international-standard project management capacity through implementing the expressway. The training provided by international consultants helped SXEC implement the expressway in accordance with advanced technical standards and international prevailing practice. After completing the expressway, the SPTD reassigned most key management and technical professionals of SXEC to other challenging road projects in Shaanxi, which implied that institutional capacity built through the project has started to benefit the sector and will be disseminated among projects.

C. Efficiency in Achieving Outcome and Outputs

34. Based on financial and economic reevaluations (appendices 9 and 10), the project was rated *efficient*.

35. The road network in Shaanxi Province has been improved significantly in the past decade. By the end of 2007, the province had 120,130 km of highway, of which 2,063 km was expressway, 6,771 km was class I and II highway, and 81,995 km was class III and IV highway. For the entire road network, about 55.9% roads are either asphalt or cement pavement. The road density of Shaanxi was 58.9 km per 100 km² in 2007, which was higher than the country average. Rural road networks were also significantly improved. A total of 97,000 km of rural roads were built or improved from 2006 to 2009 with a total investment of CNY27 billion. By the end of 2009, rural roads totaled 127,000 km. The project expressway was supplemented by the

⁸ According to the Road Environmental Manual of the PRC, a passenger car's average carbon dioxide emission rate is 231 grams (g)/km at 100 kilometers per hour (km/h), and 225 g/km at 60 km/h. The average travel speed on the project expressway is conservatively estimated to be 100 km/h, while speed on the national highway is assumed to be 60 km/h. If speed on the national highway is reduced to 50 km/h, the emission rate increases to 238 g/km; hence the total carbon dioxide reduction is likely to be more than 10%.

local road network, including upgrading of 1,605 km local roads, and was integrated with the rural roads system. Public transport services were able to cover most remote villages.

36. The reevaluated economic internal rate of return (EIRR) for the project expressway is 15.3%, compared with the 17.9% estimated at appraisal. The lower EIRR was mainly due to lower traffic on the expressway and higher operation and maintenance costs and the addition of resurfacing costs. The reevaluated EIRR is still higher than the cutoff rate of 12% and the project is considered economically viable. Sensitivity analysis was carried out to test the impacts of (i) an increase in O&M costs, (ii) a decrease in benefits, and (iii) a combination of these two scenarios. According to this analysis, the project would continue to be economically viable under all tested conditions. The project EIRR was more sensitive to changes in benefits than changes in O&M costs. The EIRR would be 12.9% if benefits decrease by 20%. In the worst case—combining a 20% increase in O&M costs and a 20% benefit reduction—the EIRR would be 12.7%, which is still higher than the cutoff rate. The economic reevaluation is in Appendix 9.

37. The financial internal rate of return (FIRR) was recalculated as 9.2%, which is slightly higher than the appraisal estimate of 8.8%. This variation was mainly due to the fact that SXEC is exempted from corporate income tax even though the operation and maintenance costs are much higher than the assumptions made at appraisal. The after-tax weighted average cost of capital (WACC) in real terms was calculated using the actual capital mix and cost of various financing sources. The revised WACC is 4.55%, higher than the appraisal estimate of 2.8%. The project's recalculated FIRR is higher than the revised WACC, and the project is considered financially viable. Sensitivity analysis was conducted to test the impacts of variations in operation and maintenance (O&M) costs and revenues. The results indicate that the project will remain financially viable when O&M costs increase by 20% and the revenue is 20% less than forecast. The financial reevaluation is in Appendix 10.

D. Preliminary Assessment of Sustainability

38. The project is likely to be sustainable. The completion of the project expressway and local roads have removed a bottleneck in the NTHS, relieved congestion in the project area, and improved the efficiency of road transport in the corridor. It has also provided convenient and direct road access to poor remote villages in the project area. Since the opening of the project expressway, a significant amount of traffic has been diverted from national highway G108 and provincial highway S106. The expressway and improved local road network has contributed to higher GDP growth in Weinan Municipality, and to poverty reduction through robust economic growth and an integrated road network. Continued economic growth in the region will ensure a steady stream of toll revenue for the SXEC, whose established ability to manage the expressway will ensure that the expressway continues to bring positive economic and social development impacts to the project areas.

39. The physical sustainability of the expressway is probable given the sound engineering technology used in its construction, acknowledgment of achievements by international prevailing standards, and the well-developed technical capacity of the SPTD and SXEC. It is expected that SXEC will continue practicing good management and sound financial administration in the future.

40. The SPTD and local government are committed to developing and maintaining local roads and rural roads networks. In October 2005, the State Council launched a new rural roads administration policy that aims to improve institutional arrangements, budgeting, and local government capacity for road management through outsourcing and market-oriented O&M. The

SPTD, through local highway bureaus, is following this new policy, which will ensure the sustainability of the local roads and rural road networks in the province. With solid fiscal budget support and comprehensive administration of the SPTD, county and township governments, including rural stakeholders, will be able to provide well-maintained rural road networks.

E. Other Impacts

41. SXEC engaged the Shaanxi Provincial Environment Monitoring Station to carry out environment monitoring activities for the project expressway from 2002. The monitoring reports indicated that the overall environmental quality was satisfactory during construction. Specifically, contractors, under the supervision of SXEC and the external monitoring agency, undertook a series of protection measures to comply with environment protection requirements. These measures included (i) ecological protection measures which consisted of temporary runoff deposit pits, reforestation of borrow and dumping pits, reclamation of temporarily acquired land, refilling of topsoil to borrow pits; (ii) noise control measures such as regulating operation of noisy machines in neighboring villages and towns; (iii) air quality protection measures which comprised periodic spraying of water on access roads and construction sites when necessary and setting up concrete stations away from villages and schools; (iv) proper positioning and protection of storage grounds of sensitive materials (such as oil, bitumen, and chemicals); and (v) setting up traffic control posts to keep nonconstruction pedestrians and vehicles out of the site, and provision of alternate underpasses and access roads for pedestrians and local vehicles. The alignment of the project expressway was optimized to avoid cultural remains and sites which were identified in the environmental impact assessment. There were no adverse impacts to these cultural sites.

42. Land acquisition and resettlement was implemented based on the resettlement plan, the 1998 Land Administration Law, and relevant government policies, regulations, and agreements. The external monitoring reports showed that the actual land compensation rates were slightly higher than those in the resettlement plan, and house compensation rates remained the same. In 2004, the SPTD provided supplementary land compensation to project-affected people in accordance with revised national land policy. As a result, the compensation rate for dry land was increased from CNY3,500/*mu* to CNY7,800/*mu*, and the rates for irrigation land and residential land were increased from CNY6,000/*mu* to CNY10,050/*mu*.⁹ Compensation rates for land occupied temporarily by the project included funds for both compensation and for restoring land to its original use. In formulating compensation rates, consideration was given to the length of occupation, the average annual output value of the land, as well as damage to the land.

43. The affected villages had received all compensation for lost land. Land acquisition compensation varied in villages. For most villages, the affected people received the replaced land through land readjustment within the village or group. The land compensation funds were either distributed among all villagers or used for improvement of village public facilities such as roads, irrigation systems, drainage, and schools. For those slightly affected villages, all compensation funds were directly delivered to the affected households without land readjustment and the affected households still had adequate farmlands after land acquisition. The external monitoring report showed that the affected households were satisfied with the transparent compensation arrangements.

44. As there was less farm land after land acquisition, some rehabilitation measures were carried out to achieve income restoration of affected households. The external monitor noted

⁹ A *mu* is a Chinese unit of measurement (1 *mu* = 666.67 m²).

that a total 1,276 mu of fruits and 5,399 mu of cash crops were developed in 70 villages, and these had an added annual value of about CNY5.8 million. A total 27,991 pigs, cattle, and sheep were bred after land acquisition, with an added annual income of CNY5.6 million. A total of 10,914 rural laborers were engaged through various employment opportunities with total annual earnings of around CNY65.5 million. Small enterprises were established to engage women in weaving, embroidery, and tourism souvenirs. In addition, local governments also conducted many training programs for affected laborers. Through a variety of means, rural incomes in the project area grew faster than the provincial average in 2007 and 2008. Rural per capita income in Weinan was CNY2,976 in 2008, an increase of 23.5% from 2007, while the provincial average rural per capita was CNY3,136, an increase of 18.6% from 2007. An evaluation of land acquisition and resettlement is shown in Appendix 11.

45. The Shaanxi Academy of Social Science (SASS) was engaged as the external monitor to conduct independent resettlement monitoring and evaluation (M&E) for the project. The academy prepared and submitted seven resettlement M&E reports for the expressway from 2001 to 2005, and three M&E reports for the local roads component from 2005 to 2007. In 2008, Chang'an University was engaged as external monitor for monitoring resettlement implementation of the additional local roads component and submitted an M&E report in January 2010. The project socioeconomic development and poverty impacts are in Appendix 12.

46. Extensive participation and full information disclosure have contributed to efficient implementation of land acquisition and resettlement. Stakeholders—including affected householders, affected villages, local government, and design institutes—participated in the process of formulating the resettlement plan, detailed measurement survey, compensation fund delivery, as well as income rehabilitation programs. Information on the project and resettlement policy were widely disseminated and announced before and during project implementation.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

47. The project was assessed *successful*. The project was (i) highly relevant to the current development strategies of the government and ADB, (ii) effective in achieving outcomes, (iii) efficient in achieving outcomes and outputs, and (iv) likely to be sustainable. The project was implemented with additional local roads. The project achieved its main objectives of accelerating economic development and thereby reducing poverty in Shaanxi Province through significant road improvements in the project area. The project (i) improved access of agricultural and industrial products to markets; (ii) improved access of the rural population to economic opportunities, employment, and social services; (iii) attracted investment by lowering transport costs in the project area; and (iv) reduced congestion and accidents on the existing roads. The project expressway experienced a startup delay but caught up to the original schedule at completion. The project cost was well under control and overall implementation was carried out effectively and efficiently. The project expressway and improvement of local roads were completed with satisfactory quality. During implementation and operation, sound technical and mitigation measures on environment aspects were widely applied to ensure strict compliance with national and local regulations and guidelines. Improved local roads enabled project benefits to trickle down to rural and poor areas and rural transport services were extended to remote and poor villages. Institutional capacity was strengthened through a human resource development plan. Substantial direct and indirect employment opportunities were created during implementation and subsequent operation. The traffic level in the early years of expressway operation was lower than the appraisal estimates. However, traffic growth increased after

completion of the transport corridor between Xi'an and Taiyuan. Traffic showed steady growth of about 20% in 2008 and 2009, and is forecast to continue to maintain robust growth in the coming years. Economic development in Shaanxi and the project area will continue to boost traffic volumes. The reevaluated FIRR (9.2%) and EIRR (15.3%) confirmed the financial and economic viability of the project.

B. Lessons

48. Bidding of expressway civil works took place in early 2002 and the government approved the detailed design in mid-2002. Thus, among other factors, bidding which was not based on detailed design resulted in some significant variations for large structures with complicated geotechnical situations. Based on this experience and similar experience in other road projects, it would be appropriate to conduct in-depth detailed geotechnical investigations before finalizing bidding documents. The MOT now requires that detailed designs are completed before procurement of expressway civil works.

49. The cost estimate of the toll system was overestimated at appraisal, and the actual cost was about one-third the appraisal estimate. The main reasons for this difference include (i) the network-based toll system arrangement resulted in cancellation of unnecessary equipment; and (ii) the cost estimate was made in 2000 and procurement was conducted in 2004, during which time the availability of more advanced IT technologies contributed to a lower and more competitive actual cost. Close follow-up on IT technology development and the toll capacity demands means that a precise cost estimate of a toll system is now possible.

50. During the project preparation stage, it was anticipated that the project expressway would generate significant local socioeconomic development impacts. The expressway served not only as an important section of the transport corridor, but also as a vital link between Weinan and Xi'an and other neighboring regions. With growing traffic volume, it was observed that toll collection capacities at some exits were limited, which periodically caused long queues. It is necessary to consider increasing toll collection capacity and efficiency by increasing the number of toll lanes and applying advanced technical measures.

51. The inclusion of 70 additional local roads for improvement was proposed and approved during the later stages of the original project implementation. Local road improvement has produced very positive impacts. However, it led to loan extensions of about 3 years. An integrated approach to combining improvement of local roads and the project expressway during project processing would ensure a more effective and efficient outcome.

52. The impacts of land acquisition and resettlement were not well estimated in the resettlement plan, which led to a 30% increase in the amount of land acquisition and a 187% increase in house demolition area. This was mainly due to impacts induced by connection roads and service stations, as well as temporary buildings that had not been included in the resettlement plan. The project was processed in early 2000, but updating the resettlement plan has since been made a standard requirement stipulated in loan covenants.

C. Recommendations

1. Project Related

53. Having efficiently completed the construction of a high-quality expressway meeting international standards, SXEC is now focused on efficient and effective expressway operation

and management. It is important for staff to be regularly trained on operation and management to keep up with the latest technologies and practices.

54. It is recommended that the project performance evaluation report for the project be prepared no later than 2011, or no later than 5 years of full operation to ensure that a more objective evaluation of the project is made.

55. Although traffic accidents on the project expressway (in terms of million ton-kilometers) are lower than on the parallel existing national highway G108 during the trial operation period, it is necessary to continue addressing road safety through all applicable engineering and management means. SSEC should, in cooperation with government agencies, maintain high safety standards and performance for the expressway.

56. SSEC may regularly review traffic forecasts to prepare sufficient tolling capacity aiming for peak season traffic and reducing unnecessary queues at the toll stations, particularly for truck and agro-cargo truck traffic. To increase the efficiency of agro-cargo truck inspection at toll stations, more advanced technology may be considered in addition to the current manual operations and inspections.

2. General

57. Public investment has dominated road sector development in Shaanxi Province during 2000 to 2009. Given that cumulative debt from commercial and development banks was about CNY90 billion from 2001 to 2008, and anticipated total investments in the road sector for the next five year plan (2011-2015) are expected about CNY120 billion, it is suggested that broader and more diversified financing channels for the sector are reviewed and explored to ensure sustainable development. Moreover, most debt may be medium and long term, which may incur potential capital cost pressure if the macroeconomic situation changes. Consideration of some financial tools to mitigate or offset such risks might be helpful.

58. Domestic agencies have gained enormous expertise on road, bridge, and tunnel design and construction in the past 20 years. It is recommended that international consulting services should focus on issues related to the environment, socioeconomic analysis, financial management, and knowledge products, and not necessarily on engineering fields where the domestic agencies are capable.

PROJECT FRAMEWORK

Design Summary	Performance Indicators and Targets		Monitoring Mechanisms	Assumptions and Risks
	Appraisal	Actual		
Goal 1. Promote sustainable economic growth in Shaanxi Province by facilitating trade and attracting investment for the project area	Economic growth for impacted cities and counties during 2001–2025 Increased tonnage of interprovincial and international trade by road Increased domestic and foreign direct investment in the project area	In 2009, municipalities maintained high gross domestic product (GDP) growth rates (Shaanxi 13.6% and Weinan 14.3%). Interprovincial passenger and freight traffic increased More investment attracted in the project area	Annual economic reporting at provincial and national levels, provincial statistical yearbooks, and county statistics	Assumption Continued rapid economic growth in the People's Republic of China, particularly in the western provinces
2. Reduce poverty by improving living standards and creating employment in poor counties and townships in Shaanxi Province	High per capita incomes, lower numbers of poor people, and improved access to social services in the counties of the project area	Rural per capita income in Weinan was CNY2,976 in 2008, a 23.5% growth from 2007, while Shaanxi's provincial average rural per capita income was CNY3,136, a 18.6% growth from 2007. Access to social services including public transport services was improved.	Participatory rural appraisal results, monitoring and evaluation, project performance management system	Assumptions Adequate funding for road improvements Complementary investments in infrastructure development, microfinance to poor households, human resource development, and social mobilization programs Adequate resettlement and environment measures
Purpose 1. Improve road infrastructure through provision of increased capacity for more efficient movement of freight and passengers at lower cost	Serious congestion on existing road national highway G108 between Yumenkou and Yanliang removed through the construction of a four-lane controlled access expressway	Traffic was diverted from G108 to the expressway and travel time reduced from more than 4 hours to less than 2 hours.	Project completion report	Assumption Demonstrated implementation capacity of Shaanxi Provincial Transportation Department (SPTD)
	East–west corridor capacity increased at opening in 2005; access improved to townships and villages through interchanges to connecting roads and complementary local road component.	The corridor transport capacity was improved and could accommodate transport demands up to 2025. Improved 1,605 km of local roads provided more access to local road users. Interchanges integrated the expressway with the local roads	Traffic counts and travel time survey for expressway and other roads in corridor, including existing G108. Annual reports of transport enterprises. Project completion report.	Risk Delay in completing the adjoining expressway section in Shanxi Province, including the Yumenkou Yellow River Bridge

Design Summary	Performance Indicators and Targets		Monitoring Mechanisms	Assumptions and Risks
	Appraisal	Actual		
		network.		
	<p>Average travel time between Yumenkou and Yanliang (176 km) reduced from 4 hours to 2.2 hours in 2005.</p> <p>Reduced vehicle costs and freight and passenger charges in the project area.</p> <p>Safer roads in the project area through separation of slow- and fast- moving traffic and separation of opposing flows.</p>	<p>Travel time was reduced to less than 2 hours in 2005.</p> <p>Vehicle operation cost was reduced.</p> <p>Though traffic volume increased significantly, traffic accidents rate in terms of million-ton-km was lower compared with the existing roads.</p>	<p>Direct measures of cost and travel time for truck and bus; direct measures of freight and passenger charges</p> <p>Accident statistics for road corridor by number and severity</p>	<p>Assumptions</p> <p>Traffic surveys undertaken</p> <p>Better traffic enforcement and accident reporting procedures</p>
2. Provide improved access to poor counties	Improved all-weather access on complementary local road component	Local roads were paved in cement or asphalt pavement which provide all-weather access to local users.	Participatory rural appraisal results, project administration missions, and reports of supervision consultants	Assumption Shaanxi Provincial Transportation Department (SPTD) is not responsible for rural socioeconomic development.
	<p>More reliable and reduced delivery time and lower transport costs for rural and agricultural inputs and outputs</p> <p>Increased volume and higher proportions of high-value agricultural products marketed</p>	<p>Local roads connected all administrative villages. Bus services accessible at village level</p> <p>Per capita net income of farmers was increased from CNY1,882 in 2005 to CNY2,976 in 2009</p>	<p>Direct measurement of cost and time for small truck on road network</p> <p>Project performance management system</p>	Risk Local governments below the provincial levels may not recognize the importance of rural capacity development issues and may not mobilize adequate resources to secure the full impact of improved transportation.
	<p>Increased mobility of the relatively poor and minorities</p> <p>Increased ownership of motorized vehicles in rural communities</p>	In Weinan Municipality, vehicle ownership grew rapidly. Weinan had 113,515 vehicles in 2007, a growth of 16.2% over 2006.	<p>Agricultural statistics</p> <p>Vehicle registrations</p>	
Outputs				
1. Civil Works and Equipment				
a. 176 km of controlled access expressway	Construction completed and expressway open to traffic by	Construction completed and the expressway opened to traffic in	Project administration missions, progress reports,	Assumption Implementation capacity of

Design Summary	Performance Indicators and Targets		Monitoring Mechanisms	Assumptions and Risks
	Appraisal	Actual		
including bridges, interchanges, link roads, service areas, underpasses, and overpasses	September 2005 Pavement roughness index lowered to <2 meters per kilometer	November 2005 Pavement roughness index reached 1.265 mm/m	and project completion report	the SPTD; good performance of contractors, and strict construction supervision and quality control
b. Completion of about 1,605 km of local road improvement	Improvement completed by 2009	Local roads completed by July 2009	Project administration missions, progress reports, and project completion report	Assumptions SPTD capacity to plan and coordinate with local governments the timely implementation of provincial and county local roads Funding availability and commitment of local government agencies
c. Equipment for road maintenance and safety, toll collection, communications, traffic management, vehicle weight and emissions testing, and office administration	Equipment operational and accident response plans implemented	Equipment procured and installed. Equipment for weight-based toll operational Emergency response plan prepared and implemented	Project administration missions, progress reports, and project completion report	Assumption Completion of equipment procurement and installation at project opening to traffic
2. Consulting Services				
a. Strengthen SPTD and national consultants' capacity in project management, quality control, traffic engineering and safety, and monitoring and evaluation	On-the-job training of SPTD staff and national consultants Implementation of a human resources development plan	SPTD and Shaanxi Xiyu Expressway Company (SSEC) carried out on-the-job training and implemented human resource development plan.	Midterm review and project administration missions Supervision consultants' reports	Assumption Selection of competent consultants who perform well
b. Establish and upgrade operations, maintenance, and management systems	Monitoring of operation and maintenance costs Level of service meeting international standards	O&M costs were monitored and managed Level of services met international standards	Annual reports	Assumption Allocation of sufficient funds for operation and maintenance
c. Establish monitoring and	Traffic volumes, passenger	Monitoring and evaluation were	Survey results	Assumption

Design Summary	Performance Indicators and Targets		Monitoring Mechanisms	Assumptions and Risks
	Appraisal	Actual		
evaluation methodology	fares, and freight rates; social impact of the expressway; impact on resettled, relocated, and indigenous people; environmental impact; and upgrading and maintenance of local roads	carried out by consultants and external monitor		Adequate organizational skills within SPTD supplemented by international and national consultants, particularly in social and environmental assessment
3. Resettlement and Compensation				
a. About 955 hectares (ha) of land acquired	Implementation of land acquisition and resettlement plan	A total of 1,224 ha land was acquired	Monitoring and evaluation, project performance management system, and participatory rural appraisal	Assumption Adequate land for new house sites available within villages for resettlement
b. 10,938 people affected, including 9,244 losing land and 1,694 with housing affected as well as 45 affected by partial removal of enterprises	Welfare of those resettled reestablished at least to level prevailing before acquisition. Less than 10% of resettled people will be transferred to urban areas.	The number of people affected by land acquisition was 61,270. A total of 73,244 square meters (m ²) of buildings were demolished. The number of people affected by house demolition was 1,628. Average per capita annual income of affected households increased 54% from CNY1,089 in 2000 to CNY1,680 in 2006.	Independent consultant monitoring during resettlement implementation, at completion, and 1 year after	Assumptions Implementation of agreed-upon compensation rates Timely compensation payments and resettlement Off-farm income opportunities made available for those left with insufficient farm sizes will be rewarding.
4. Environment				
a. Environmental mitigation measures	Implementation and monitoring plan based on summary environmental impact assessment (SEIA) and summary initial environmental examination (SIEE) are agreed upon by executing agency and the Asian Development Bank. Mitigation measures included in contractors' contracts	SEIA was implemented and monitored. The project has been accepted by State Environmental Protection Agency (SEPA) after the environment acceptance mission conducted in May 2008. Mitigation measures were included in the contract and followed.	Project administration missions, project completion report, monitoring and evaluation	Risks The project area may have unexplored archeological sites. Executing agency, supervision consultants, and contractors are committed to implementation of mitigation measures

CHRONOLOGY OF MAJOR EVENTS

Date	Events
30 August 1999	Approval of project preparatory technical assistance
27 November–7 December 2000	Fact-finding mission fielded
14 February 2001	Management Review Meeting held
19 February–1 March 2001	Appraisal mission fielded
28 May 2001	Staff Review Committee meeting
6 July 2001	Establishment of Shaanxi Xiyu Expressway Company
13–16 July 2001	Loan negotiations held
9 August 2001	Board circulation
30 August 2001	Loan approval
16 April 2002	Contract for consulting services approved
13–17 May 2002	Inception mission fielded
10 June 2002	Loan Agreement signed
16 August 2002	Contract awards for first civil works packaged approved
8 November 2002	Loan effectiveness
6 December 2002	Commencement of civil works construction
24 June 2003	First disbursement
8–14 October 2003	Loan review mission fielded
1 January 2004	Transfer of the project administration to PRC resident mission
25–29 October 2004	Loan review mission fielded
29 March 2005	First contract for equipment approved
5 November 2005	Loan review mission fielded
27 November 2005	Project expressway opened to traffic for trial operation
26–30 December 2005	Midterm review mission fielded
15 February 2006	First repayment of loan principal
20 March 2006	First loan extension approved
18–19 December 2006	Loan review mission fielded
28 December 2006	Link road with Yellow River Bridge completed
18 September 2007	Second loan extension approved
2–8 November 2007	Loan review mission fielded
11 January 2008	First loan reallocation approved
15 April 2008	Third loan extension approved
17 May 2008	SEPA conducted acceptance mission for the expressway
28 July 2008	A major change in project scope approved
25–28 November 2008	Loan review mission fielded
31 July 2009	Local roads completed
28 October 2009	Final disbursement
7 January 2010	Actual loan closing date
26 January–2 February 2010	Project completion review mission fielded

PRC = People's Republic of China, SEPB = State Environmental Protection Bureau.

Sources: Asian Development Bank, Shaanxi Provincial Transportation Department, and Shaanxi Xiyu Expressway Company.

PROJECT COSTS AND FINANCING PLAN

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

Item	At Appraisal			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
A. Base Cost						
1. Expressway Civil Works	215.70	233.00	448.70	168.32	454.37	622.69
2. Equipment	22.60	2.50	25.10	8.77	4.97	13.74
3. Land Acquisition and Resettlement	0.00	75.00	75.00	0.00	93.74	93.74
4. Consulting Services and Training	2.10	13.80	15.90	1.65	17.81	19.46
5. Local Roads	11.40	45.80	57.20	41.64	123.02	164.66
Subtotal (A)	251.80	370.10	621.90	220.38	693.91	914.29
B. Contingencies						
1. Physical Contingencies	20.10	29.60	49.70	0.00	0.00	0.00
2. Price Contingencies	13.60	26.00	39.60	0.00	0.00	0.00
Subtotal (B)	33.70	55.60	89.30	0.00	0.00	0.00
C. Front-End Fee	2.50	0.00	2.50	2.50	0.00	2.50
D. Interest and Commitment Charges During Construction	24.00	19.30	43.30	25.58	23.13	48.71
Total (A+B+C+D)	312.00	445.00	757.00	248.46	717.04	965.50

Sources: Asian Development Bank, Shaanxi Provincial Transportation Department, and Shaanxi Xiyu Expressway Company.

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

Source	At Appraisal			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
Asian Development Bank	250.00	0.00	250.00	248.46	0.00	248.46
Ministry of Transportation	0.00	145.00	145.00	0.00	146.70	146.71
Shaanxi Provincial Government	62.00	119.00	181.00	0.00	207.95	207.95
Domestic Banks	0.00	181.00	181.00	0.00	362.39	362.39
Total	312.00	445.00	757.00	248.46	717.04	965.50

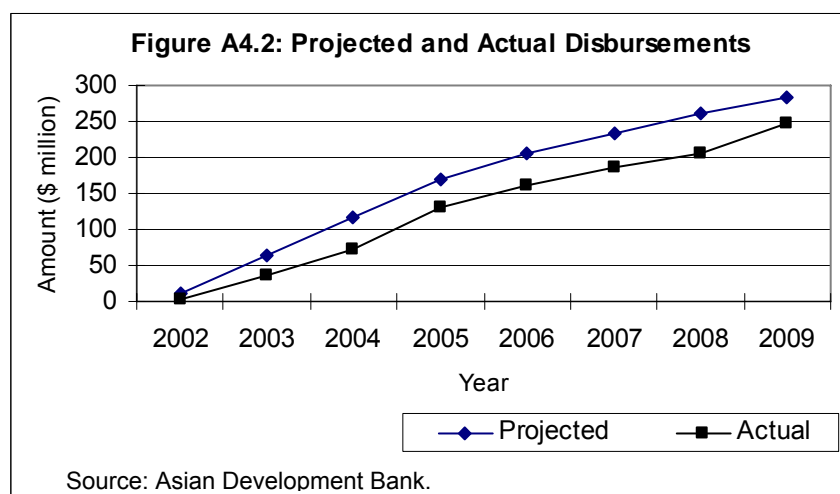
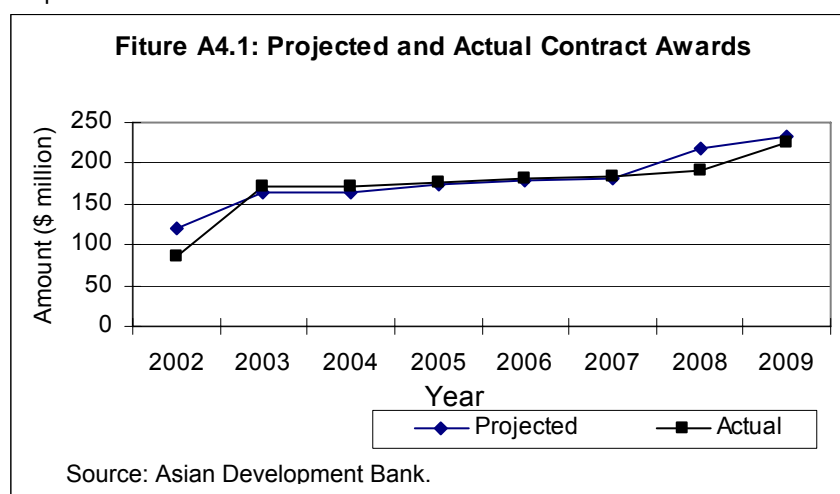
Sources: Asian Development Bank, Shaanxi Provincial Transportation Department, and Shaanxi Xiyu Expressway Company.

PROJECTED AND ACTUAL CONTRACT AWARDS AND DISBURSEMENTS

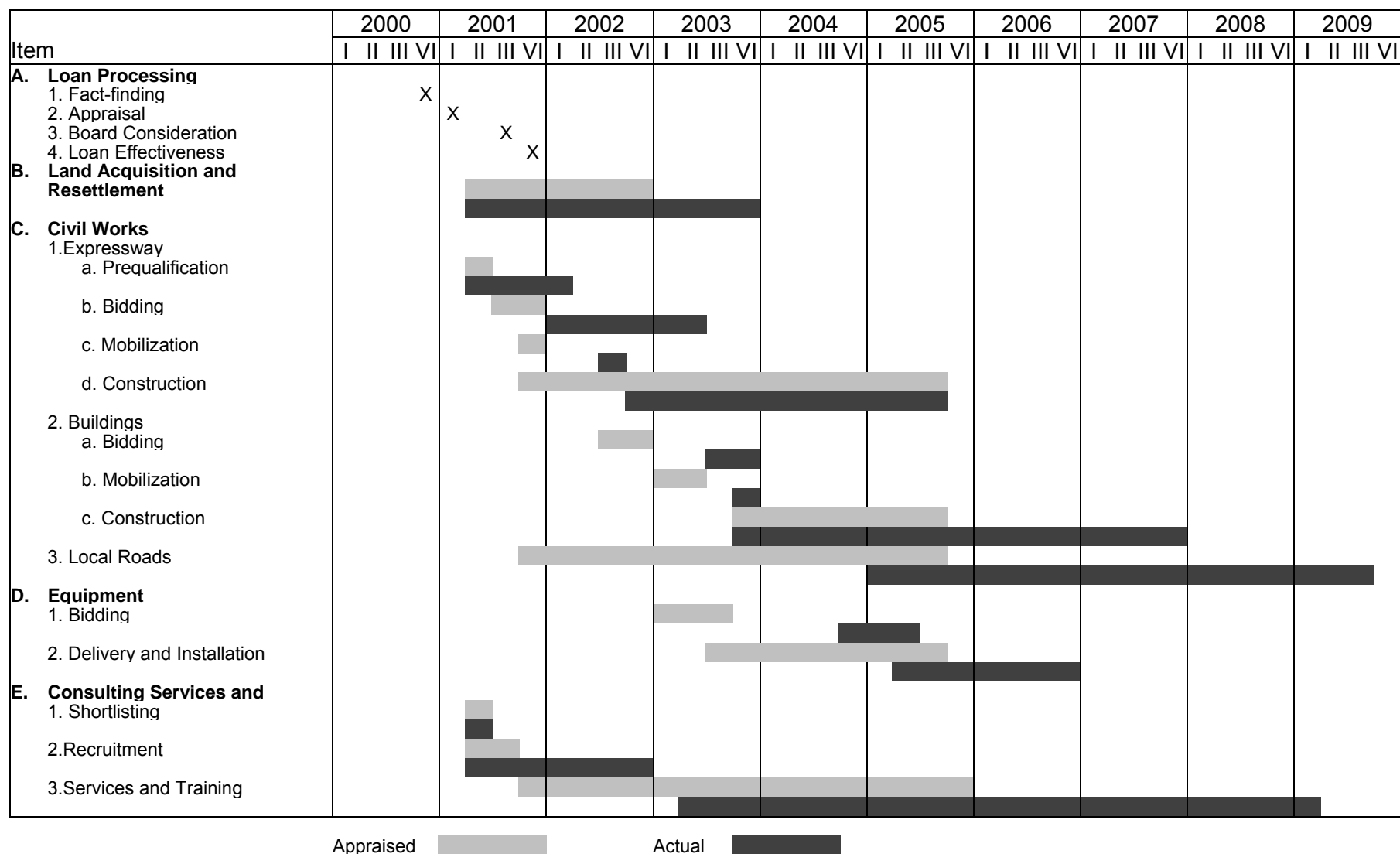
Table A4: Projected and Actual Contract Awards and Disbursements
(\$ million)

Year	Contract Awards			Disbursement		
	Projected	Actual	Actual/Projected (%)	Projected	Actual	Actual/Projected (%)
2002	120.00	86.37	71.98	12.00	2.50	20.83
2003	43.00	85.08	197.86	52.00	32.85	63.17
2004	0.00	0.00	0.00	53.45	37.11	69.43
2005	11.00	4.99	45.36	52.66	58.25	110.62
2006	5.00	5.66	113.20	36.00	29.20	81.11
2007	3.00	0.59	19.67	26.00	26.99	103.81
2008	35.00	8.26	23.60	30.00	18.48	61.60
2009	16.00	35.11	219.44	20.00	43.08	215.40
Total	233.00	226.06	97.02	282.11	248.46	88.07

Source: Asian Development Bank.



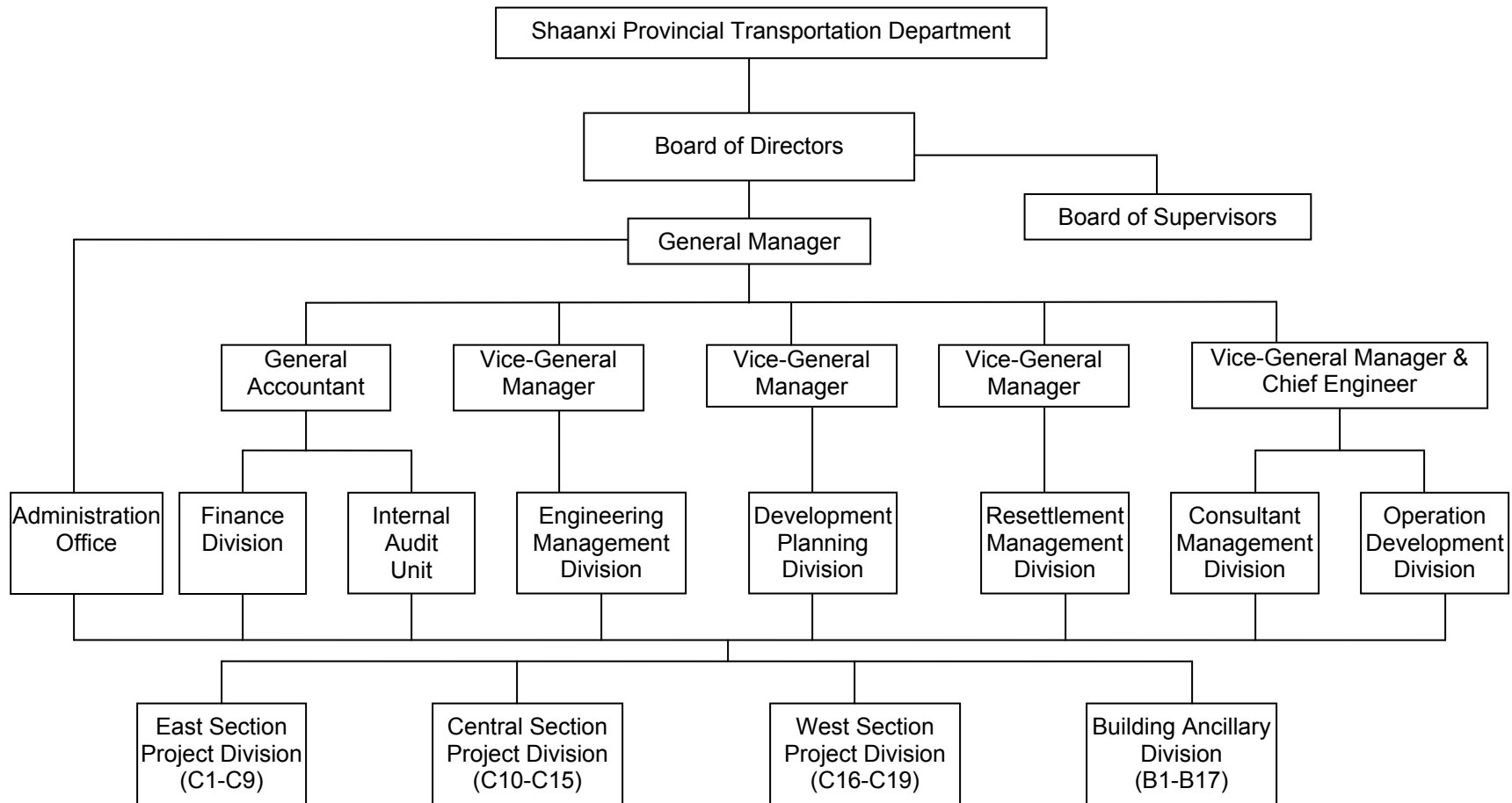
APPRAISED AND ACTUAL IMPLEMENTATION SCHEDULE



Sources: Shaanxi Provincial Transportation Department and Shaanxi Xiyu Expressway Company.

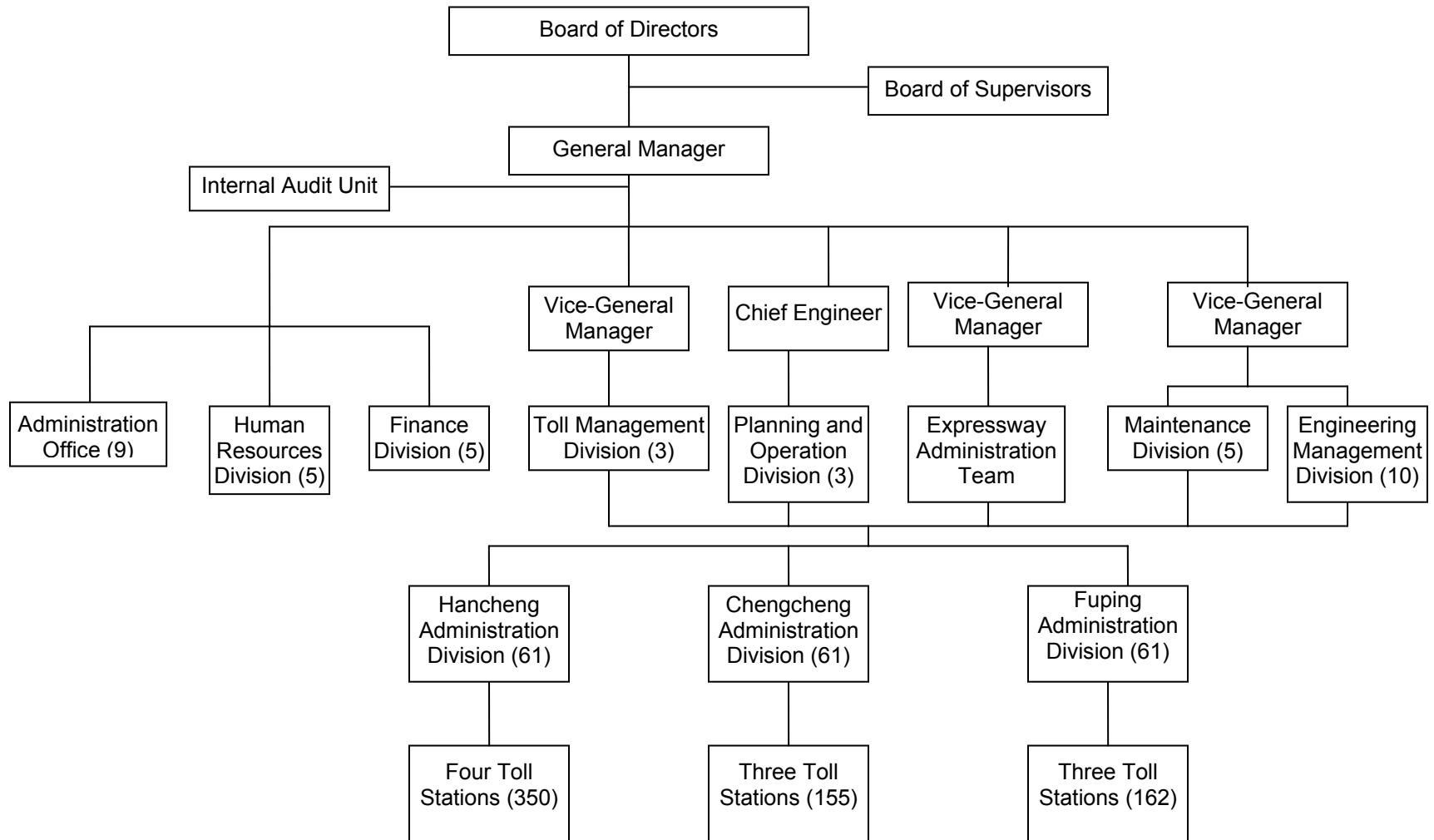
ORGANIZATION CHARTS OF SHAANXI XIYU EXPRESSWAY COMPANY

Figure A6.1: Organization Chart for Construction Period



Note: Codes in brackets show the contract packages.
Source: Shaanxi Xiyu Expressway Company.

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



Note: Numbers in brackets show the number of staff in the division or station.
Source: Shaanxi Xiyu Expressway Company.

COMPLIANCE WITH LOAN COVENANTS

Covenants	Reference to Loan Documents	Status of Compliance
<p>Project Executing Agency SPTD shall be the Project Executing Agency. SPTD shall have overall responsibility for Project implementation and shall directly carry out the local roads component of the project through local governments.</p>	PA, Schedule, para. 1	Complied with.
<p>Project Implementation Agency The Company shall be the Project Implementing Agency and responsible for the construction, operation, and maintenance and management of the project expressway. The general manager of the Company shall be the Project Director, responsible for overall management of the project in regard to the project expressway, approval of contracts, and payments. A Project Implementation Unit (PIU) shall be established in the Company to ensure the monitoring and follow-up of implementation. PIU shall be headed by a Project Manager responsible for physical implementation of the project activities on a day-to-day basis and the preparation of progress reports. The Project Manager shall be assisted by a team of qualified engineering, financial and administrative staff.</p>	PA, Schedule, para. 2	Complied with. Shaanxi Xiyu Expressway company was established with qualified staff and was responsible for implementation, operation, and maintenance of the project expressway.
<p>Concession Framework Agreement Prior to commencement of construction, Shaanxi shall cause SPTD to enter into the Concession Framework Agreement with the company to ensure autonomy of operations, encourage the establishment of road facility performance indicators, and facilitate refinancing of road sector assets. Shaanxi and the Company shall follow the Concession Framework Agreement during the construction, operation and maintenance, and management of the project expressway. Shaanxi shall not revoke, repeal, suspend or withdraw, or transfer or assign to any third party the rights of the Company in respect to construction, operation and maintenance, management of project expressway, and collection of tolls on the project expressway without ADB's prior agreement.</p>	PA, Schedule, para. 3	Concession agreement with SPTD was signed. Complied with.
<p>Counterpart Financing SPTD and SEXEC will obtain, on a timely basis, all funds and resources necessary for project implementation. The Government will take, and will cause SPG, through SPTD, to take all necessary measures to ensure that SPTD and SEXEC can successfully implement the project, and operate and manage it after completion.</p>	LA, Schedule 6, para. 1	Complied with. Counterpart funds from MOT and SPG, and domestic loans available to the project in a timely manner.

Covenants	Reference to Loan Documents	Status of Compliance
Construction Quality SPTD and SEXEC will ensure that the project is constructed in accordance with MOC's technical standards of highway engineering and the highway design manual developed under ADB-financed TA 2573-PRC: Review of Highway Design Standards; and that construction supervision, quality control, and contract management follow national standards and internationally accepted practices.	PA, Schedule, para. 4	Complied with. Project quality was rated <i>excellent</i> by the government.
Road safety To ensure safe road facilities, SPTD and SEXEC will implement the road safety signage, communication, hazard barriers, traffic monitoring, and vehicle weighing. SPG will ensure that SPTD and SEXEC and the public security bureau cooperate closely to implement all road safety measures. Before opening the expressway, SPTD will submit a report on the emergency response system to ADB for review.	PA, Schedule, para. 5	Complied with. Unit accident rate (accident per million-km) was lower than existing road.
Tolls Tolls for the expressway will be set at levels sufficient to satisfy debt service obligations, O&M costs, and depreciation in excess of debt service; and to generate a reasonable return on assets. Six months before the expressway is opened, SPTD through SEXEC will seek ADB's concurrence on the proposed toll structure and levels prior to SPG's approval. For the first five years of operation, SPTD through SEXEC will review the toll structure and levels annually and submit a report to ADB. If the toll levels need adjustment, SPTD through SEXEC will seek ADB's concurrence on the planned adjustment before SPG approval is sought.	PA, Schedule, para. 6	Complied with. Tolls were regularly reviewed.
Sound Development Management To promote sound development management, SEXEC will establish and maintain the internal audit unit. SEXEC will give the international consultant designated as the team leader-cum-assistant chief supervision engineer with all the necessary powers to review and help certify variation orders and contractors' monthly payments, before the chief supervision engineer approves them.	PA, Schedule, para. 7	Complied with.
Financial Ratios To ensure financial sustainability, SEXEC will maintain for the project expressway (a) a debt-to-equity ratio of not more than 60:40; (b) a working ratio (operating and annual, but excluding periodic and maintenance cost to revenue) of not more than 12 percent during expressway operation; and (c) a debt service coverage ratio of not less than 1.2 during project expressway operation from the first year of full operation.	PA, Sections 2.16, 2.17, and 2.18	SEXEC would be able to comply with (b) and (c) from 2010 and (a) from 2013.

Covenants	Reference to Loan Documents	Status of Compliance
<p>Human Resource Development and Training SXEC in consultation with SPTD will prepare a human resource development plan. Before undertaking international training, SXEC will prepare, for ADB's concurrence, (a) a training plan and a list of nominated candidates, (b) a program of workshops to be delivered at SXEC by those trained internationally, and (c) a list of training equipment and aids required to strengthen SXEC's domestic training programs. Upon completion of each workshop, SXEC will submit to ADB an evaluation of the international training and the workshop.</p>	PA, Schedule, para. 9	Complied with. International and domestic trainings were conducted and knowledge learnt was disseminated.
<p>Nongovernment Financing Before construction starts, SPTD will enter into a concession framework agreement with SXEC. Six months before the opening of the project facilities, SPTD through SXEC will analyze the feasibility of attracting nongovernment investment funds for future road subsector investment, including private sector participation in O&M of the project expressway, and report its conclusions to ADB.</p>	PA, Schedule, para. 10	Complied with. So far, no private sector entity has expressed interest in the project.
<p>Financial Reporting SXEC will submit to ADB audited accounts and financial statements for the project expressway annually during construction and in the first five years of operation. Independent auditors will audit such statements, including the project account, income statement, funds statement, and balance sheet. The audited accounts and financial statements will be submitted within nine months of the end of each related fiscal year.</p>	PA, Sections 2.09(a) and (b)	Being complied with. Audit report for fiscal year 2009 will be submitted before 30 September 2010.
<p>Environment Protection SPTD and SXEC will ensure that the project is constructed and operated in accordance with environmental procedures and guidelines of the Government and ADB, that any adverse environmental impacts arising from the project are minimized by implementing the mitigation measures and environmental monitoring program presented in the EIA, and that the implementation of the environmental monitoring program – including mitigation measures, and copies of permits, licenses and clearances – is regularly reported to ADB as specified in the EIA, including violations of safety and environmental standards, if any, and their correction.</p>	PA, Schedule, paras. 11-13	Complied with.

Covenants	Reference to Loan Documents	Status of Compliance
<p>Land Acquisition and Resettlement</p> <p>SPTD and SEXEC will ensure that the resettlement plan, including land acquisition is carried out promptly and efficiently, in line with the Government's Land Administration Law and ADB's policy on involuntary resettlement; that all affected people are consulted on the entitlements at least four months before ground clearing starts; that sufficient budget is made available; affected people are compensated on time; and that those affected are at least as well off as they were before resettlement. SPTD and SEXEC will ensure that implementation of the resettlement plan is monitored and evaluated by a local institute and reported annually to ADB, and that a baseline survey is carried out as required in the plan. SPTD and SEXEC will keep ADB informed of the progress of resettlement activities through regular reporting as specified in the resettlement plan.</p>	PA, Schedule, paras. 14-18	Complied with.
<p>Poverty Reduction</p> <p>SXEC will cause the contractor to maximize the employment of local poor persons who meet the job and efficiency requirements for construction of the project roads. Such workers will be provided on-the-job training. The Government will cause SPG to extend the coverage and quality of public utilities, basic health, and basic education in the project area to enhance the poverty reduction impacts. SXEC will monitor the impacts on poverty with the assistance of a designated local institute and will submit biannual monitoring reports to ADB.</p>	LA, Schedule 6, para. 3 and PA, Schedule, para. 19	Complied with. During construction and operation, local poor people were provided with employment opportunities.
<p>Gender and Development</p> <p>SPTD and SEXEC will follow ADB's policy on gender and development during project implementation, and will take all necessary actions to encourage women living in the project area to participate in planning and implementing the project. SPTD will monitor the effects on women during project implementation, through gender-disaggregated data in the resettlement plan and the monitoring and evaluation system.</p>	PA, Schedule, para. 20	Complied with.
<p>Health Risks</p> <p>SPTD and SEXEC, together with the appropriate authorities, will ensure that contractors disseminate information on the risks of socially transmitted diseases to those employed during project implementation. SPTD and SEXEC will also ensure that similar information is disseminated to transport operators during operation of the project facilities.</p>	PA, Schedule, para. 21	Complied with. Information about health risks such as SARS, Influenza A, and STDs was disseminated.

Covenants	Reference to Loan Documents	Status of Compliance
<p>Axle Loads</p> <p>SPTD, through Sxec, will take appropriate measures to prevent overloading on the project expressway by installing vehicle axle weighing equipment at selected entry points. SPTD through Sxec will make suitable arrangements for operation of such equipment. Before opening the project expressway, Sxec will submit to ADB the plan for operation of the vehicle weigh stations, including the prescribed axle load limits and penalties for infringement.</p>	PA, Schedule, para. 22	Complied with. Weight-based toll became national standard requirements.
<p>Vehicle Emissions</p> <p>Sxec will review recommendations under the ADB- financed TA 5973-REG: Action Plans for Reducing Vehicle Emissions. Sxec will cooperate with and assist the Environmental Protection Bureau of Shaanxi in controlling vehicle emissions on the project expressway and consult with the State Environmental Protection Administration to facilitate accreditation of clearances and permits issued by other provincial environmental protection bureaus to the vehicles using the project expressway. Before opening the project expressway, Sxec will submit to ADB the emission regulation limits prescribed by the Government, penalties for their infringement, and the plan for enforcing vehicle emission control for the expressway.</p>	PA, Schedule, para. 23	Complied with.
<p>Monitoring and Evaluation</p> <p>SPTD and Sxec will monitor and evaluate impacts through a project performance management system to ensure that facilities are managed effectively and benefits are maximized. SPTD and Sxec will collect data agreed upon with ADB before implementation, at completion of the project, and three years later.</p>	PA, Schedule, para. 24	Complied with. M&E reports were submitted regularly.
<p>Change in Ownership</p> <p>If (a) any change in ownership of the project facilities, or (b) any sale, transfer, or assignment of SPTD's interest in the project expressway, is anticipated, the Government, SPG, and Sxec will consult ADB at least six months before the change. The Government, SPG, and Sxec, will ensure that any proposed change in ownership of the project facilities is carried out in a legal and transparent manner.</p>	LA, Schedule 6, para. 4	Complied with. So far, no change of ownership.
<p>Coordination Arrangement</p> <p>The Borrower will ensure that (a) Shanxi Province will construct the section of the expressway in the province, adjacent to the project expressway, in a timely manner to maximize the benefits of the project expressway, and (b) the contiguous section in Shanxi Province is constructed in</p>	LA, Schedule 6, para. 5	Complied with.

Continued on next page

Covenants	Reference to Loan Documents	Status of Compliance
accordance with the same technical standards as those of the project expressway.		
<p>Co-financing</p> <p>In the event the Company is unable to obtain local currency co-financing for the project from the China Construction Bank in the amount of \$181.0 million equivalent within six months of the Effective Date, the Borrower, shall, or shall cause the Company to: (i) enter into other arrangements, satisfactory to ADB, to obtain the required additional funding necessary for timely and effective implementation of the project; or (ii) without prejudice to the obligations of the Borrower under Section 4.02 of the Loan Agreement, provide additional counterpart funds to finance any shortfall which results from the Company's inability to obtain such local currency co-financing or the alternative funding referred to para. 1 above.</p>	LA, Schedule 6, para. 2	Complied with. Loan from domestic bank was obtained in a timely manner.

ADB = Asian Development Bank, EIA = environment impact assessment, LA = Loan Agreement, MOC = Ministry of Communications, PA = Project Agreement, PRC = People's Republic of China, SARS = severe acute respiratory syndrome, STD = sexually transmitted disease, SPTD = Shaanxi Provincial Transportation Department, Sxec = Shaanxi Xiyu Expressway Company, TA = technical assistance.

Source: Asian Development Bank

EXPRESSWAY CIVIL WORKS, LOCAL ROADS, AND EQUIPMENT PACKAGES

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Appendix 8

Table A8.1: Expressway Civil Works
(CNY)

No.	Contractor	Mode of Procurement ^a	Contract Date	Country	Original Contract Amount	Variations	Final Contract Amount
C1	China Railway 11th Bureau Group	ICB	6 Dec 2002	PRC	168,263,992	129,636,096	297,900,088
C2	China Railway First Group Company	ICB	6 Dec 2002	PRC	69,630,581	16,367,721	85,998,302
C3	The 20th Engineering Bureau of China Railway	ICB	31 Dec 2002	PRC	144,168,883	24,550,556	168,719,439
C4	The 20th Engineering Bureau of China Railway	NCB	1 Jun 2002	PRC	278,610,633	(31,187,523)	247,423,110
C5	The First Engineering Company of Zhongjiao Group	NCB	1 Sep 2001	PRC	217,772,798	(27,485,376)	190,287,422
C6	The First Division of the 20th Bureau of China Railway	NCB	1 Sep 2001	PRC	114,163,353	36,855,012	151,018,365
C7	The Fifth Engineering Company of the First Highway Engineering Bureau of Road and Bridge Group	ICB	6 Dec 2002	PRC	109,179,129	83,474,078	192,653,207
C8	The Fourth Branch of the Second Highway Engineering Bureau	ICB	31 Dec 2002	PRC	115,867,030	27,502,138	143,369,168
C9	The Third Engineering Company under China Railway Wujia Group	ICB	6 Dec 2002	PRC	135,218,406	47,740,390	182,958,796
C10	The 17th Engineering Bureau of China Railway	ICB	31 Dec 2002	PRC	159,711,983	61,360,915	221,072,898
C11	China Railway 11th Bureau Group	ICB	6 Dec 2002	PRC	201,014,883	89,387,537	290,402,420
C12	Xinjiang Road and Bridge Construction Company	ICB	6 Dec 2002	PRC	94,975,916	28,239,428	123,215,344
C13	No. Four Division of 11th Bureau of China Railway Construction Corporation	ICB	18 Jun 2003	PRC	163,013,969	45,669,460	208,683,429
C14	China Railway First Group Company	ICB	31 Dec 2002	PRC	143,675,877	64,862,983	208,538,860
C15	Eastern Alliance Construction Engineering Company	ICB	6 Dec 2002	PRC	173,979,777	52,418,803	226,398,580
C16	The Second Highway Engineering Bureau of Road and Bridge Group	ICB	6 Dec 2002	PRC	126,079,513	80,086,919	206,166,432
C17	The First Engineering Company of China Tiesiju Civil Engineering Group	ICB	31 Dec 2002	PRC	182,414,328	48,413,103	230,827,431
C18	Shaanxi Provincial Road and Bridge Engineering Company	ICB	31 Dec 2002	PRC	228,481,738	62,722,183	291,203,921
C19	The Third Bureau of China Railway Group	NCB	1 Sep 2001	PRC	193,310,618	52,168,660	245,479,278
Total					3,019,533,407	892,783,083	3,912,316,490

() = negative, CNY = yuan, ICB = international competitive bidding, NCB = national competitive bidding, No. = number, PRC = People's Republic of China.

^a Packages procured through NCB were financed by domestic funds.

Sources: Asian Development Bank and Shaanxi Xiyu Expressway Company.

Table A8.2: Local Roads

No.	County	Scope	Technical Standards (km)			
			Class II	Class III	Class IV	Subtotal
1	Pucheng	Qianyuan Highway		33		33
2	Pucheng	Cailong Road Longchi–Wangxi		7		7
3	Pucheng	Luobinzhen Qianwa–Binanbao			15	15
4	Pucheng	Sunzhen–Wujia			7	7
5	Pucheng	Yongwu Road			12.5	12.5
6	Pucheng	Yuanzhang Road			7.5	7.5
7	Pucheng	Chunli Road			12.8	12.8
8	Pucheng	Potou–Panlong		40		40
9	Pucheng	Longyang–Jincheng		15		15
10	Pucheng	Xitou–Dongcheng–Baiqisi			31	31
11	Chengcheng	Anrao highway			10	10
12	Chengcheng	Liujiawa–Wangzhuzi			19	19
13	Chengcheng	108 national highway–Jijiazhuang			9	9
14	Chengcheng	Chengbai road–Niancun			8	8
15	Chengcheng ^a	Huanglong–Fengyuan–Chengcheng	67			67
16	Chengcheng	Chengcheng County–Boundary of Baishui		30		30
17	Chengcheng	Leijiawa–Dudian		5		5
18	Chengcheng	Liuzhuo–Shanhua		16		16
19	Chengcheng	Fengyuan–Xishe			26	26
20	Heyang	Beiheichi–Nanshecun section of Xinhua road			4.5	4.5
21	Heyang	Heichi–Mengzhuang of Heicheng highway			15.6	15.6
22	Heyang	Nancai–Shanyang			7.8	7.8
23	Heyang	Yangjiazhuang (108)–Panjiashan			13.5	13.5
24	Heyang	Xinchipozhao–Nanshun			5	5
25	Heyang	Donglei–Heyang			9.8	9.8
26	Heyang	Baili–Xinciniuzhuang			12	12
27	Heyang	Heyang County–Chengcheng County		8		8
28	Heyang	Majiazhuang–Huayuan		9		9
29	Heyang	Heyang County–Huangpuzhuang		28		28
30	Heyang	Fangzhen–Bailiang		18		18
31	Heyang	Baiyun–Duanjia–Muodong			15	15
32	Fuping	Jinzhuang Highway Dongqicun–Wangma		28.5		28.5
33	Fuping	Zhuangchang Road			8	8
34	Fuping	Caocun–Baimiao			14.5	14.5
35	Fuping	Liuji–Shijia		14.8		14.8
36	Fuping	Yangyao–Meiyuan			7	7
37	Fuping	Zhangqiao–Daoxian		22		22
38	Fuping	Meiyuan–Leicun–Zhuangli		20		20
39	Fuping	Youdian–Liugu–Kangqiao			23	23
40	Hancheng	Zhidong road		30.5		30.5
41	Hancheng	Zhouyuan–Xianglibao			10	10
42	Hancheng	Suidong–Xiemadian			8	8
43	Hancheng	Shangyukou–Boundary to Yijun County		40		40
44	Hancheng	Xizhuang–Panlong		12		12
45	Hancheng	Linyuan–Jingjiawan			33	33
46	Dali	Dongyang–Huaiyuan		13		13
47	Dali	Guangwei Road		12.5		12.5
48	Dali	Dongquan–Donggaoming Road			18	18
49	Dali	Qiangbai–Qian'er			10	10
50	Dali	Xiaozai–Xiyang Highway			6	6
51	Dali	Liangyi–Fangjia			6	6
52	Dali	Diangan–Xialu			8	8
53	Dali	Xuzhuang–Buchang		10		10
54	Dali	Hancun–Huayuan		17		17
55	Dali	Huayuan–Lu'an–Majiazhuang		18		18
56	Dali	Dali–Railway Station		15		15
57	Dali	Duanjia–Fengchun–Puda Road			14	14

No.	County	Scope	Technical Standards			
			(km)			Subtotal
			Class II	Class III	Class IV	
58	Dali	Gaozhang–Shuangquan–Liangyi–Anchang			15	15
59	Baishui	Menlin Highway		16		16
60	Baishui	Longzhong–Suncai road			8	8
61	Baishui	Baishui–Sujiawa			10	10
62	Baishui	Xudao–Shashipo			9.7	9.7
63	Baishui	Leiya–Yanjia		19		19
64	Baishui	Shiguan–Cangjimiao–Fengyuan		10		10
65	Baishui	Baishui–Boundary of Chengcheng		20		20
66	Baishui	Yaohe–Shoushui–Boundary of County		8		8
67	Baishui	Yaohe–Edong			23	23
68	Linwei	Guanyou Road		35.2		35.2
69	Linwei	Weibai Road			9.5	9.5
70	Linwei	Wihua Road Shijia–Yangjiashan			10.5	10.5
71	Linwei	Sanlun–Tielu			10	10
72	Huaxian	Liuluo Road		10		10
73	Huaxian	Xiahou Road		5		5
74	Huaxian	Huamai Road		5.3		5.3
75	Huaxian	Donggua Road		5.1		5.1
76	Huaxian	Huajinxi Road		10		10
77	Huayin	S202–Yanjia Highway			8	8
78	Huayin	Mengyuan–Puyuku			8	8
79	Tongguan	Guangli Road–Beixiema			10	10
80	Tongguan	Guangkou–Haochayukou			15.1	15.1
81	Tongguan ^a	Provincial Boundary to Tongguan county	13			13
82	Yintai	Jinsuoguan–Louzigou			30	30
83	Yintai	Tanzhuangta–Juntailing			7	7
84	Yaozhou	Wenwangshan–Mu'ao			30	30
85	Wangyi	Huangbaozhen–Ancun			10	10
86	Wangyi	Wulipu–Juntailing			8	8
87	Wangyi	Ganglilu–Beixiema			12	12
88	Yanchuang	Wengao Road		13.5		13.5
89	Ansai	Huahe Road		25		25
90	Zhidan	Jingzhi Road		58.6		58.6
91	Wuqi	Changwu Road		27		27
92	Yichuang	Yijiao Road		14.1		14.1
93	Yichuang	Leizao Road		18		18
94	Yichuang	Gaohu Road		20		20
95	Luochuang	Baiqing Road		7		7
96	Luochuang	Baishi Road		23.6		23.6
97	Luochuang	Huaiwu Road		10		10
98	Huanglong	Xiaohuang Road		15		15
99	Huangling ^a	Dianshuang Road	11			11
100	Fuxian	Nanniu Road		36		36
Total			91.0	873.7	640.3	1,605.0

No. = number, km = kilometer.

^a Procurement of local roads followed national competitive bidding procedure while the rest roads were implemented in force account.

Sources: Shaanxi Provincial Transportation Department.

Table A8.3: Equipment

No.	Item	Mode of Procurement	Date of Contract	Country	Contractor	Contract Amount
1	Toll Collection System and Traffic Monitoring System	ICB	20 May 2005	PRC	Bright Oceans Corporation	CNY14,913,375.81
2	Communication System	ICB	30 May 2005	PRC	Hubei Province Institute for Science of Traffic	CNY9,166,996.00
3	Communication Pipelines	ICB	29 May 2005	PRC	Bright Oceans Corporation	CNY11,877,320.66
4	Maintenance and Management Equipment	ICB	28 Nov 2006	United States	Transtech International Limited Liability Company	\$392,257.00
5	Vehicles	ICB	4 Dec 2006	PRC	Shaanxi Jinbang Company	CNY2,882,200.00
6	Daily Maintenance Equipment	ICB	1 Dec 2006	PRC	Beijing Craftech Technology Company Limited	CNY2,125,004.00
7	Maintenance Machinery	ICB	4 Dec 2006	PRC	Nanjing Jinpeng Street. Maintenance Car Sell Limited	CNY1,769,414.50
8	Testing Device	ICB	4 Dec 2006	PRC	Earth Products China	\$997,638.00
9	De-ice Vehicles	ICB	20 Dec 2006	PRC	Freotech Technology	\$342,823.60
10	Snow Cleaning Vehicle	ICB	28 Dec 2006	PRC	Anshan Senyuan Road Bridge Machinery Company	CNY1,893,472.00
11	Road Test Vehicle	ICB	15 June 2008	PRC	Earth Products China	\$732,324.00
12	Road Hot-Patch Vehicles	ICB	15 June 2008	PRC	Freotech Technology	\$678,256.80

CNY = yuan, ICB = international competitive bidding, No. = number, PRC = People's Republic of China
Sources: Asian Development Bank and Shaanxi Xiyu Expressway Company

ECONOMIC REEVALUATION

A. General

1. The project comprises a four lane expressway of 176 kilometers (km) from Yanliang to Yumenkou and improvement of 1,605 km of local roads. The economic reevaluation is conducted for the expressway component and does not cover the costs and benefits of the local road component. The reevaluation is undertaken using with-project and without-project scenarios in accordance with ADB's Guidelines for the Economic Analysis of Projects. Without the project, corridor traffic would use the existing national highway 108 (G108), which will be more congested, and result in increased vehicle operating costs (VOCs), longer travel times, and more road accidents. With the project, the corridor transport capacity is increased, which allows the vehicles on the project expressway to travel faster, over a shorter distance, and with lower operating costs. Congestion on G108 is also alleviated, which brings benefits of shorter travel time and lower VOCs. More traffic is generated due to better transport conditions and lower operation cost. The evaluation period covers the implementation period from 2001 to 2008 and the operation period from 2006 to 2025.

B. Revised Traffic Forecast

2. The project expressway traverses the middle of Shaanxi Province, connecting Xian, the provincial capital, with the border with Shanxi Province. It forms a trunk road linkage between Shaanxi Province and northern China, and southeastern China. The opening of the expressway has brought substantial socioeconomic changes to the project area. The revised traffic forecast has been conducted taking into account the actual traffic since 2006, composition of the traffic, future socioeconomic development in the project area, and overall future transport demand of the corridor.

Table A9.1: Revised Traffic Forecast
(pcu per day)

Year	At Appraisal	At PCR		
	(Corridor Traffic)	Expressway	G108	Corridor Total
2005	14,688	–	12,262	12,262
2010	20,408	16,185	7,376	23,561
2015	28,358	24,221	9,414	33,635
2020	36,538	33,025	11,563	44,588
2024	44,752	38,634	12,862	51,396
Average Annual Growth Rate (%)				
2008–2009	6.8	20	5	15
2010–2011	6.8	10	5	8
2012–2016	6.8	8	5	7
2017–2020	5.2	6	4	5
2021–2024	5.2	4	2	3

G108 = national highway 108, PCR = project completion report, pcu = passenger car unit
Sources: Asian Development Bank and Shaanxi Provincial Transportation Department

3. The project expressway and highway G108 constitute the main east–west transport corridor in the project area. Before the expressway opened there was significant traffic congestion on G108. In 2005, the annual average daily traffic on G108 was 12,262 vehicles, and several sections of G108 had reached capacity. A significant proportion of traffic has been diverted to the expressway since it was opened to traffic in November 2005. In 2006, the traffic

on G108 was 2,370 passenger car units per day (pcu/day), or 20% of the level of 2005. The actual traffic on the expressway was 2,645 pcu/day in 2006, 9,337 pcu/day in 2007, and 11,386 pcu/day in 2008, representing annual growth rates of more than 20%. The sharp increase in expressway traffic was mainly due to the diverted traffic from G108 attracted by the improved road conditions and the shorter distance. During 2010–2011, traffic growth for the expressway will drop to 10%, and further slow to 8% in 2012 and 4% by 2024; traffic growth on G108 will drop from 5% in 2012 to 2% in 2024. These growth rates are conservative considering the anticipated economic growth rates. Table A9.1 compares the traffic forecast at appraisal¹ with the actual and projected traffic at project completion.

4. The expressway traffic has demonstrated four features: (i) the traffic diversion effect of the project expressway is significant because the expressway has significantly improved road conditions and shortened the travel distance; (ii) the average travel distance is relatively long because the completion of connected expressways has stimulated transit traffic on the project expressway; (iii) induced traffic accounted for a small proportion (about 5%) of the total expressway traffic in the initial years, although this proportion is expected to grow gradually to about 20% over the evaluation period; and (iv) there is a high proportion of passenger traffic (more than 60% of the total traffic). The revised traffic forecast by vehicle type is provided in Table A9.2.

Table A9.2: Revised Traffic Forecast by Vehicle Type
(vehicles per day)

Year	Small		Medium		Large		Super Truck	Trailer Truck	Total
	Car	Truck	Bus	Truck	Bus	Truck			
2006	1,967	358	17	372	171	320	120	169	3,491
2007	3,934	715	34	743	341	639	239	337	6,982
2008	4,690	747	53	832	476	575	317	603	8,293
2009	5,628	896	63	998	571	690	380	724	9,952
2010	6,191	986	70	1,098	628	759	418	796	10,947
2011	6,810	1,085	77	1,208	691	835	460	876	12,041
2012	7,355	1,171	83	1,305	747	902	497	946	13,005
2013	7,943	1,265	90	1,409	806	974	537	1,021	14,045
2014	8,578	1,366	97	1,522	871	1,052	580	1,103	15,169
2015	9,265	1,476	105	1,644	941	1,136	626	1,191	16,382
2016	10,006	1,594	113	1,775	1,016	1,227	676	1,286	17,693
2017	10,606	1,689	120	1,882	1,077	1,300	717	1,364	18,754
2018	11,243	1,791	127	1,994	1,141	1,378	760	1,445	19,880
2019	11,917	1,898	134	2,114	1,210	1,461	805	1,532	21,072
2020	12,632	2,012	142	2,241	1,282	1,549	854	1,624	22,337
2021	13,138	2,092	148	2,331	1,334	1,611	888	1,689	23,230
2022	13,663	2,176	154	2,424	1,387	1,675	923	1,757	24,159
2023	14,210	2,263	160	2,521	1,442	1,742	960	1,827	25,126
2024	14,778	2,354	167	2,622	1,500	1,812	999	1,900	26,131
2025	15,369	2,448	173	2,726	1,560	1,884	1,039	1,976	27,176

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department.

¹ Traffic unit used at appraisal was medium truck equivalent (MTE), which is converted to the unit used in the project completion report by applying a conversion factor of 2 (1 MTE = 2 passenger car units).

C. Costs

5. The economic costs include (i) the capital costs for the expressway, (ii) the costs of operation and maintenance (O&M), and (iii) the cost for anticipated resurfacing and replacement of major equipment. The economic costs are derived from financial costs by applying a standard conversion factor of 0.97.

D. Benefits

6. The economic benefits that are quantified in the reevaluation include (i) savings in VOCs, (ii) travel time savings for passengers, and (iii) benefits to generated traffic.

7. VOC savings are the main source of economic benefits. Unit VOC data for different types of vehicles under different road and traffic condition has been used in the calculation. The VOC savings for different types of vehicles range from CNY0.18 to CNY2.01 per vehicle kilometer for the expressway traffic. The project expressway is about 86 km shorter than the section of G108 in the project area. VOC savings from the reduced travel distance was calculated accordingly. VOC for the traffic on the G108 is also reduced as a result of the reduced congestion. The unit VOC savings for G108 traffic is CNY0.12–CNY0.36 per vehicle kilometer. For generated traffic, half of the VOC savings are considered as the benefits. Table A9.3 provides the unit VOC savings values by vehicle type for both the expressway and G108.

Table A9.3: Vehicle Operation Costs
(2008 prices, CNY/vehicle km)

Vehicle Type	Small		Medium		Large		Super	Trailer
	Car	Truck	Bus	Truck	Bus	Truck	Truck	Truck
Expressway	0.91	0.91	1.97	1.05	3.37	2.21	4.33	7.13
G108 (without project)	1.12	1.10	2.50	1.36	4.52	2.87	5.27	9.13
G108 (with project)	1.09	1.05	2.23	1.32	4.17	2.79	5.15	8.87
Saving (Expressway)	0.21	0.18	0.53	0.31	1.15	0.66	0.94	2.01
Saving (G108)	0.03	0.05	0.27	0.04	0.35	0.08	0.12	0.26

CNY = yuan, km = kilometer, G108 = national highway 108.

Sources: Shaanxi Provincial Transportation Department.

8. Passenger travel time savings are estimated for different types of passenger vehicles. The average passenger time value is derived from the gross domestic product (GDP) per capita of Shaanxi Province in 2008, and assumed to increase at 8% in 2010 and 4% by 2025, consistent with the anticipated GDP growth rates. Other factors considered in recalculating travel time savings include average vehicle load, percentage of working trips, travel distance, and speeds for with-project and without-project scenarios.

9. The benefits of reduced road accidents were considered an important part of the economic benefits at appraisal. The actual road accidents statistics (Table A9.4) for G108 and the expressway for 2006–2008, however, do not indicate a clear effect of the project on accident reduction. Increased vehicle speed, growing traffic, and poor driving behavior are the main contributing factors to the incidence of accidents, which fluctuate widely. It would need a longer observation time to identify the effect of the project on road accidents and quantify the parameters for such effect. The reevaluation therefore doesn't include this benefit due to lack of reliable information.

Table A9.4: Road Accident Statistics

Year	Roads	Accidents	Fatalities	Injuries	Loss (CNY'000)
2006	G108	16	19	4	640
	Expressway
2007	G108	29	34	15	1980
	Expressway	9	8	4	50
2008	G108	28	30	10	1550
	Expressway	19	17	13	1140

Source: Shaanxi Xiyu Expressway Company.

E. Economic Internal Rate of Return Reevaluation

10. The reevaluated economic internal rate of return (EIRR) for the project expressway is 15.3%, compared with the 17.9% estimated at appraisal. The lower EIRR was mainly due to lower traffic on the expressway and higher O&M costs and the addition of resurfacing costs. The reevaluated EIRR is still higher than the cutoff rate of 12% and the project is considered economically viable. The economic reevaluation result is provided in Table A9.5.

11. Sensitivity analysis was carried out to test the impacts of (i) an increase in O&M costs, (ii) a decrease in benefits, and (iii) a combination of these two scenarios. According to this analysis, the project would continue to be economically viable under all tested conditions. The project EIRR was more sensitive to changes in benefits than changes in O&M costs. The EIRR would be 12.9% if the benefits decrease by 20%. In the worst case—combining a 20% increase in O&M costs and a 20% benefit reduction—the EIRR would be 12.7%, which is still higher than the cutoff rate. The result of the sensitivity analysis is provided in Table A9.6.

Table A9.5: Economic Reevaluation
(CNY million)

Year	Costs			Benefits			Total	Net Benefit
	Capital	O&M	Total	VOC Saving	Time Savings	Generated Traffic		
2001	31		31					(31)
2002	141		141					(141)
2003	1,022		1,022					(1,022)
2004	1,128		1,128					(1,128)
2005	1,499	1	1,500					(1,500)
2006	371	40	411	149	74	2	225	(186)
2007	219	37	256	290	144	5	439	183
2008	207	50	257	383	190	6	579	322
2009		55	55	455	220	7	682	627
2010	276	58	335	498	271	8	777	443
2011		61	61	546	295	9	850	789
2012		64	64	589	317	10	915	851
2013		67	67	635	340	10	985	918
2014	258	71	328	684	365	11	1,061	733
2015		74	74	738	577	12	1,327	1,252
2016		78	78	795	619	13	1,428	1,350
2017		82	82	842	654	14	1,510	1,429
2018		86	86	777	691	53	1,521	1,436
2019		90	90	822	730	57	1,609	1,519
2020		95	95	871	916	60	1,846	1,752
2021		99	99	905	952	62	1,920	1,821
2022		104	104	940	987	65	1,992	1,888
2023	258	109	367	977	1,022	68	2,067	1,700
2024		115	115	1,015	1,059	70	2,144	2,029
2025	(5,217)	121	(5,096)	1,054	1,098	73	2,225	7,321

Economic Internal Rate of Return (EIRR) : 15.3%

Discount Rate :12.0%

Net Present Value : 1,074

() = negative, CNY = yuan, O&M = operation and maintenance, VOC = vehicle operating cost.

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department.

Table A9.6: Sensitivity Analysis
(%)

Item	Changes			NPV (CNY million)
	O&M Cost	Benefits	EIRR	
Base Case	0	0	15.3	1,074
	10		15.2	1,047
	20		15.1	1,019
Change		(10)	14.1	673
		(20)	12.9	273
	20	(20)	12.7	219

() = negative, CNY = yuan, EIRR = economic internal rate of return, NPV = net present value, O&M = operation and maintenance.

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department.

FINANCIAL REEVALUATION

A. Introduction

1. The financial reevaluation is undertaken in accordance with ADB's Guidelines for the Financial Management and Analysis of Projects. The project has both revenue and nonrevenue components. The 176-kilometer four-lane expressway from Yanliang to Yumenkou is the revenue component under the project. Financial reevaluation is conducted on the revenue-generating component. The expressway is being operated by the Shaanxi Xiyu Expressway Company (SSEC). The evaluation period covers the implementation period from 2001 to 2008 and the operation period from 2006 to 2025.

B. Basic Assumptions

2. The capital cost is based on actual expenditures incurred for the expressway. For the financial internal rate of return (FIRR) calculation, the cost of interest during construction is excluded. The actual capital cost is similar to the appraisal estimates. The actual expressway operation and maintenance expenses from 2006 to 2008 were provided by SSEC. Depreciation expenses were excluded for FIRR calculation. It was assumed that the operating cost and routine maintenance cost would increase by 5% in real terms each year to ensure the expressway facilities remain in good condition. Resurfacing at a cost of CNY1.5 million per kilometer will be conducted every 10 years and the cost of this is treated as a capital cost.

3. The actual toll revenues for 2005–2009 are included and the future toll revenues will increase consistent with the traffic growth. Toll rates (Table A10.1) have been applied to the expressway since 2006 and are considered to be adequate; no increase in the toll level is assumed for the reevaluation. The overall toll level is slightly lower than the appraisal estimates. Non-toll vehicles, including trucks carrying fresh agriculture products, account for 5% of total traffic. Toll revenues are subject to a surcharge of 3% for the purpose of water infrastructure construction, and this is treated as taxes. There are no other sources of revenue for the expressway. SSEC is exempted from business tax and corporate income tax, which was not anticipated at appraisal. All revenues and expenses were expressed in 2008 prices for the FIRR calculation. The residual value of fixed assets is considered based on the economic life of expressway facilities.

Table A10.1: Toll Rates for Project Expressway

Item	Vehicle Class				
	1	2	3	4	5
Truck (tons)	<2	2–5	5–10	10–15 and 20 ft container	>15 and 40 ft container
Bus (seats)	<7	8–9	20–39	>40	
Toll Rate (CNY/vehicle kilometer)	0.40	0.70	0.90	1.12	1.30

CNY = yuan, ft = foot.

Source: Shaanxi Xiyu Expressway Company.

C. Financial Internal Rate of Return

4. The FIRR was recalculated as 9.2% (Table A10.2) which is slightly higher than the appraisal estimate of 8.8%. This variation was mainly due to the fact that SSEC is exempted from corporate income tax although the operation and maintenance costs are much higher than the assumptions applied at appraisal. The after-tax weighted average cost of capital (WACC) in

real terms was calculated using the actual capital mix and cost of various financing sources. The revised WACC is 4.55%, higher than the appraisal estimate of 2.80%. The project's recalculated FIRR is higher than the revised WACC, and the project is considered financially viable.

5. Sensitivity analysis was conducted to test the impacts of variations in O&M costs and revenues. The results indicate that the project will remain financially viable even when O&M costs are increased by 20% and when the revenue is 20% less than the forecast. Considering the conservative traffic forecast (see details in Appendix 10), the event that the actual traffic constantly falls short of the forecasts to the extent that the project becomes unviable during the evaluation period is less likely to occur. The result of the sensitivity analysis is shown in Table A10.3.

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

Year	Costs			Revenue	Taxes ^a	Net Cash Flow
	Capital	O&M	Total			
2001	33		33			(33)
2002	154		154			(154)
2003	1,109		1,109			(1,109)
2004	1,224		1,224			(1,224)
2005	1,627	1	1,628	8	0	(1,620)
2006	403	44	446	143	4	(308)
2007	238	40	278	286	9	(1)
2008	224	54	278	361	11	71
2009		72	72	468	14	382
2010	300	63	363	560	17	180
2011		66	66	616	18	531
2012		69	69	665	20	576
2013		73	73	719	22	624
2014	266	77	342	776	23	411
2015		80	80	838	25	733
2016		84	84	905	27	794
2017		89	89	959	29	842
2018		93	93	1,017	31	893
2019		98	98	1,078	32	948
2020		103	103	1,143	34	1,006
2021		108	108	1,188	36	1,045
2022		113	113	1,236	37	1,086
2023	266	119	384	1,285	39	862
2024		125	125	1,337	40	1,172
2025	(2,505)	131	(2,374)	1,390	42	3,723
						FIRR = 9.2%

() = negative, CNY = yuan, FIRR = financial internal rate of return, O&M = operation and maintenance

^a Taxes refer to 3% surcharge on toll revenues.

Sources: Asian Development Bank and Shaanxi Provincial Transportation Department.

Table A10.3: Sensitivity Analysis

(%)			
Item	Changes in		FIRR
	O&M Cost	Revenue	
Base Case	0	0	9.2
	10		9.1
	20		9.0
Change		(10)	8.4
		(20)	7.5
	20	(20)	7.3

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

Source: Asian Development Bank.

D. Financial Performance of Shaanxi Xiyu Expressway Company

6. The Shaanxi Xiyu Expressway Company (SSEC) was established in 2001 to construct and operate the Yanliang to Yumenkou Expressway. The financial performance evaluation is undertaken on SSEC's overall operations. SSEC's actual financial statements for 2005–2008 and projected financial statements are presented in Tables A10.4 and A10.5.

7. As covenanted in the Project Agreement, SSEC shall maintain (i) a debt–equity of not more than 60:40; (ii) a working ratio (operating and maintenance cost to revenue) of not more than 12%, commencing from the first year of full operation; and (iii) a debt service coverage ratio of not less than 1.2, also commencing from the first year of full operation. The projected financial statements indicate that SSEC will be able to comply with the working ratio and debt service coverage ratio starting from 2010, and the debt–equity ratio starting from 2013.

Table A10.4: Shaanxi Xiyu Expressway Company Financial Statements, 2005–2014
(CNY million)

Income Statements	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Operating Revenues										
Toll Revenue	8	143	286	361	468	560	616	665	719	776
Less: Taxes (3%)	0	4	9	11	14	17	18	20	22	23
Net Operating Revenue	7	138	277	350	454	543	598	645	697	753
Operating Expenses										
O&M Cost	1	44	40	54	60	65	70	76	82	89
Depreciation		1	3	2	2	267	267	267	267	267
Total Operating Expenses	1	45	43	56	62	332	337	343	349	356
Net Operating Income	7	93	235	294	392	211	260	302	348	397
Total Interest Expenses		182	213	212	185	175	164	154	143	133
Income Before Corporate Tax	7	(88)	21	82	207	37	96	148	204	264
Corporate Tax (0%)										
Net income	7	(88)	21	82	207	37	96	148	204	264
Cash Flow Statements	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Net Cash Inflows from Operating Activities										
Net Income	7	(88)	21	82	207	37	96	148	204	264
Depreciation		1	3	2	2	267	267	267	267	267
Net Changes in Working Capital	223	(92)	8	48	(264)	298	(1)	(330)	(1)	(1)
Cash Inflows from Financing										
ADB Loan	455	177	95	14						
Domestic Loan	600	300	250							
MOT and Shaanxi Government	1,232	20	159							
Cash Inflow Total	2,517	318	537	145	(55)	602	362	86	471	531
Construction Cost	1,627	403	238	224		300				266
Debt Service (principle repayment)										
ADB Loan		24	26	29	32	35	39	43	47	52
Domestic Loan				136	136	136	136	136	136	136
Cash Outflow Total	1,627	427	264	389	168	471	175	179	183	454
Net Cash Flows	890	(109)	272	(244)	(223)	131	187	(93)	288	77
Opening Balance	(597)	293	184	456	212	(10)	121	308	215	503
Closing Balance	293	184	456	212	(10)	121	308	215	503	580
Balance Sheet	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Current Asset										
Cash	293	140	229	111	(10)	121	308	215	503	580
Accounts Receivable	27	65	3	33	9	11	12	13	14	15
Fixed Asset										
Accumulated Fixed Asset	0	112	46	47	5,011	5,011	5,340	5,340	5,340	5,606
Less Accumulated Depreciation		1	4	6	8	275	542	809	1,076	1,343
Net Fixed Asset	0	111	42	41	5,003	4,736	4,798	4,531	4,264	4,263
Work in Progress	4,147	4,549	4,795	4,993						
Total Asset	4,467	4,866	5,069	5,178	5,002	4,868	5,118	4,759	4,781	4,857
Current Liability										
Accounts Payable	250	195	142	219	3	3	333	4	4	4
Long-Term Loans										
ADB Loan	1,055	1,232	1,327	1,341	1,309	1,273	1,234	1,191	1,144	1,091
Domestic Loan	1,920	2,255	2,305	2,298	2,162	2,027	1,891	1,755	1,620	1,484
Equity										
Paid-in Capital	200	200	200	200	200	200	200	200	200	200
Retained Earnings	1,042	984	1,095	1,120	1,328	1,364	1,460	1,609	1,813	2,078
Total Liabilities and Equity	4,467	4,866	5,069	5,178	5,002	4,868	5,118	4,759	4,781	4,857
Debt–Equity Ratio	71%	75%	74%	73%	69%	68%	65%	62%	58%	53%
Working Ratio	10%	32%	14%	15%	13%	12%	12%	12%	12%	12%
Debt Service Coverage Ratio		0.46	0.99	0.78	1.12	1.38	1.55	1.71	1.88	2.07

() = negative, ADB = Asian Development Bank, CNY = yuan, MOT = Ministry of Transportation, O&M = operation and maintenance.

Sources: Figures for 2005–2008 were actual data provided by Shaanxi Xiyu Expressway Company and figures for 2009–2024 were estimated by Asian Development Bank.

Table A10.5: Shaanxi Xiyu Expressway Company Financial Statements, 2015–2024
(CNY million)

Income Statements	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Operating Revenues										
Toll Revenue	838	905	959	1,017	1,078	1,143	1,143	1,236	1,285	1,337
Less: Taxes (3%)	25	27	29	31	32	34	34	37	39	40
Net Operating Revenue	813	878	931	986	1,046	1,108	1,108	1,199	1,247	1,297
Operating Expenses										
O&M Cost	96	104	112	121	131	142	154	166	180	194
Depreciation	267	267	267	267	267	267	267	267	267	267
Total Operating Expenses	363	371	379	388	398	409	421	433	447	461
Net Operating Income	450	507	551	598	647	699	688	766	800	835
Total Interest Expenses	122	110	99	87	74	62	49	35	21	15
Income Before Corporate Tax	328	397	453	511	573	638	639	731	779	821
Corporate Tax (0%)										
Net income	328	397	453	511	573	638	639	731	779	821
Cash Flow Statements	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Net Cash Inflows from Operating Activities										
Net income	328	397	453	511	573	638	639	731	779	821
Depreciation	267	267	267	267	267	267	267	267	267	267
Net Changes in Working Capital	(1)	(1)	(1)	(1)	(1)	(1)	1	(1)	(0)	(0)
Cash Inflows from Financing										
ADB Loan										
Domestic Loan										
MOT and Shaanxi Government										
Cash Inflow Total	595	663	719	778	839	904	907	996	1,046	1,087
Construction Cost									266	
Debt Service (principle repayment)										
ADB Loan	58	64	70	77	85	94	104	114	126	139
Domestic Loan	136	136	136	136	136	136	136	136		
Cash Outflow Total	193	199	206	213	221	230	239	250	391	139
Net Cash Flows	401	464	513	565	618	674	667	747	654	949
Opening Balance	580	981	1,445	1,958	2,523	3,141	3,815	4,483	5,229	5,884
Closing Balance	981	1,445	1,958	2,523	3,141	3,815	4,483	5,229	5,884	6,833
Balance Sheet	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Current Asset										
Cash	981	1,445	1,958	2,523	3,141	3,815	4,483	5,229	5,884	6,833
Accounts Receivable	16	18	19	20	21	22	22	24	25	26
Fixed Asset										
Accumulated Fixed Asset	5,606	5,606	5,606	5,606	5,606	5,606	5,606	5,606	5,871	5,871
Less Accumulated Depreciation	1,610	1,877	2,144	2,411	2,678	2,945	3,212	3,479	3,746	4,013
Net Fixed Asset	3,996	3,729	3,462	3,195	2,928	2,661	2,394	2,127	2,125	1,858
Work in Progress										
Total Asset	4,993	5,191	5,438	5,737	6,090	6,498	6,898	7,380	8,034	8,717
Current Liability										
Accounts Payable	5	5	6	6	7	7	8	8	9	10
Long-Term Loans										
ADB Loan	1,034	970	900	823	738	644	540	426	300	161
Domestic Loan	1,348	1,213	1,077	941	806	670	534	399	399	399
Equity										
Paid-in Capital	200	200	200	200	200	200	200	200	200	200
Retained Earnings	2,406	2,803	3,256	3,767	4,340	4,977	5,616	6,347	7,126	7,947
Total Liabilities and Equity	4,993	5,191	5,438	5,737	6,090	6,498	6,898	7,380	8,034	8,717
Debt–Equity Ratio	48%	42%	36%	31%	25%	20%	16%	11%	9%	6%
Working Ratio	12%	12%	12%	12%	13%	13%	14%	14%	14%	15%
Debt Service Coverage Ratio	2.28	2.50	2.69	2.89	3.10	3.32	3.32	3.63	7.27	7.19

() = negative, ADB = Asian Development Bank, CNY = yuan, MOT = Ministry of Transportation.

Sources: Figures for 2005–2008 were actual data provided by Shaanxi Xiyu Expressway Company and figures for 2009–2024 were estimated by Asian Development Bank

EVALUATION OF LAND ACQUISITION AND RESETTLEMENT

A. Scope of Land Acquisition and Resettlement

1. The resettlement plan for the Shaanxi Roads Development Project was prepared by the Shaanxi Provincial Transportation Department (SPTD) with the assistance of the project preparatory technical assistance (TA) consultant in May 2000 and revised in May 2001. The resettlement plan was prepared to guide resettlement implementation for both the expressway and local roads component. A new resettlement plan was prepared for the additional local roads component due to changes in project scope in early 2008. The resettlement plan showed that the expressway project construction would involve land acquisition, demolition of buildings, and resettlement of affected persons. Total land acquisition was estimated to be 939 hectares (ha) (14,090 mu ¹). The impact of land loss was estimated to be equivalent to loss of livelihood for 6,938 persons. Building demolitions were estimated to total 25,480 square meters (m^2) and require about 1,093 people to be relocated. In addition, the expressway project was to temporarily borrow 3,495 mu of land for construction purposes. The local roads component (phase I and phase II) would acquire 49.8 hectares (ha) of land. Building demolitions were estimated to total 5,523 m^2 .

2. According to the SPTD's project completion report, most resettlement activities for the expressway project began in September 2001 and were completed by October 2003. In total, 18,356.5 mu of land were permanently acquired, which was 30.3% more than estimated in the resettlement plan. The number of people affected by land acquisition was 61,270.² A total of 73,244 m^2 of buildings were demolished, which was 187.5% more than estimated in the resettlement plan. The number of people affected by house demolition was 1,628. The significant increase of project impacts is mainly due to the fact that impact numbers in the resettlement plan only covered the main line and excluded connecting roads and service stations, as well as temporary buildings. Phase I of the local roads component was completed by the end of 2006 and phase II was completed by 2009. The overall impacts of house demolition in the local roads component were minimized during implementation through design variations. Consequently, under the local roads component, 736.6 mu of land was acquired and only 1,754 m^2 of buildings were demolished. Table A11.1 presents the actual project impacts as compared to those estimated in the resettlement plan.

B. Resettlement Policy and Compensation Rates

3. Land acquisition and resettlement was implemented based on the resettlement plan, the 1998 Land Administration Law, and the following government rules, regulations, and agreements: (i) circular no. 8 for decision of speeding up highway construction issued by Shaanxi Provincial Government in 2001; (ii) circular no. 64 for land acquisition and house relocation compensation for Xiyu Expressway issued by Shaanxi Provincial Government in 2002; and (iii) agreements on land acquisition, resettlement, and environment safeguards for Xiyu Expressway construction between the Xiyu Expressway Company and the Weinan Municipal Government (May 2002). For both expressway and local roads, the external reports showed that the implemented land compensation rates were slightly higher than those in the resettlement plan, and house compensation rates remained the same.

¹ A mu is a Chinese unit of measurement (1 mu = 666.67 m^2).

² The abnormal variation is due to different calculation methodologies. The number of persons affected by land acquisition in the resettlement plan was roughly calculated by 100% land lost (the number of affected persons is equal to amount of land acquisition divided by per capita land holding in each affected village), the number of affected persons provided by SPCD's project completion report was based on actual impacts.

Table A11.1: Project Land Acquisition and Resettlement Impacts

Item		Unit	Expressway	Local Roads	Total
A. Permanent Land Acquisition	RP	mu	14,090.5	747.2	14,838
	Actual	mu	18,356.5	736.6	19,093
	Actual vs RP	%	30.3	(1.4)	28.7
B. Temporary Land Use	RP	mu	3,495.0	18.0	3,513
	Actual	mu	3,348.0	61.4	3,409
	Actual vs RP	%	-4.2	241.1	(2.9)
C. Building Demolition	RP	m ²	25,481	5,523.3	31,004
	Actual	m ²	73,244	1,754	74,998
	Actual vs RP	%	187.5	(68.2)	141.9
D. Affected Persons					
By Land Acquisition	RP	persons	6,938	3,317	10,255
	Actual	persons	61,270	2,034	63,304
	Actual vs RP	%	783.1	-38.7	517.3
By House Demolition	RP	persons	1,315	412	1,727
	Actual	persons	1,628	89	1,717
	Actual vs RP	%	23.8	(78.4)	(0.6)

() = negative, m² = square meter, mu = Chinese unit of land measurement equal to 666.67 m², RP = resettlement plan.

Source: Shaanxi Provincial Transportation Department.

4. In 2004, the Government of the People's Republic of China (PRC) launched a significant reform on land acquisition policy and subsequent a detailed policy was updated and released by the Shaanxi Provincial Government in 2005. As requested by the Ministry of Land and Resources, the SPTD provided supplementary compensation to the project-affected people. As a result, the compensation rate for dry land was increased from CNY3,500/mu to CNY7,800/mu, and the rates of irrigated land and residential land were increased from CNY6,000/mu to CNY10,050/mu. Table A11.2 compares the actual compensation rates under the project with the rates outlined in the resettlement plan.

Table A11.2: Compensation Rates

Item	Unit	RP	Actual
A. Permanent Land Acquisition			
Vegetable Land	CNY/mu	8,200	...
Irrigated Field	CNY/mu	5,740	10,050
Dry Land	CNY/mu	3,280	7,800
Sloping Land	CNY/mu	1,600	3,500
Residential Land	CNY/mu	5,740	10,050
B. Young Crop Compensation			
Vegetable Land	CNY/mu	400	...
Irrigated Field	CNY/mu	350	400
Dry Land	CNY/mu	200	400
Sloping Land	CNY/mu	100	400
C. House Compensation			
Brick-Concrete	CNY/m ²	260–300	260–300
Brick-Timber	CNY/m ²	200–250	200–250
Earth-Timber	CNY/m ²	160–200	160–200
Simple	CNY/m ²	60–80	60–80

... = no data available, CNY = yuan, m² = square meter, mu = Chinese unit of land measurement equal to 666.67 m²,
 RP = resettlement plan

Source: Shaanxi Provincial Transportation Department

5. Compensation rates for land occupied temporarily by the project included funds for both compensation and for restoring land to its original use. In formulating compensation rates, consideration was given to the length of occupation, the average annual output value of the land, as well as damage to the land. Contractors paid compensation directly to affected persons. The external monitoring reports showed that the contractor paid affected households annually at a rate of CNY1,000/mu for irrigated lands and CNY700/mu for dry land in addition to young crop compensation. An additional CNY1,000/mu for rehabilitation of temporary land use was also paid by contractors as a deposit for guarantee.

C. Resettlement Measures and Income Restoration

6. According to the survey by the external monitor, the Shaanxi Academy of Social Science (SASS), after land acquisition the average per capita cultivated land holding in project affected villages was reduced by 7.9% from 1.90 mu to 1.75 mu amongst the 141 affected villages (Table 11.3).

Table A11.3: Variation of Per Capita Land Holding in Affected Village

Per Capita Cultivated Land Reduced (mu)	Number of Villages	Villages (%)	Per capita Cultivated Land Reduced (%)	Number of Villages	Villages (%)
≤0.05	42	29.8	≤5%	76	53.9
0.06–0.10	54	38.3	5%–10%	42	29.8
0.11–0.15	16	11.4	10%–15%	18	12.8
0.16–0.20	16	11.4	≥15%	5	3.5
0.21–0.25	3	2.0			
≥0.26	10	7.1			
Total	141	100.0	Total	141	100.0

mu = Chinese unit of land measurement equal to 666.67 m².

Source: External Monitoring Report on Land Acquisition and Resettlement (No.7), Shaanxi, Academy of Social Science, 2005.

7. The affected villages have received all compensation for loss of land. The use of land acquisition compensation is different in different villages. For most villages, the affected people received the replaced land through land readjustment within the village or group; the land compensation funds were either distributed among all villagers in the village or used to improve village public facilities such as roads, irrigation systems, and schools. For those slightly affected villages, all compensation funds were directly delivered to the affected households without land readjustment, as the affected households still have adequate farmlands left after acquisition by the project. How to use or allocate land compensation funds was decided by villagers; after concurrence of 80% or more of villager representatives was gained, a formal report with villagers' endorsement was submitted to the county government through the township level. After approval by the county government, the funds were disbursed by local banks. The monitoring report showed that the affected households were satisfied with compensation and transparency.

8. Given the decrease in farm lands after land acquisition, various economic rehabilitation measures have been taken to achieve income restoration of affected households. The external monitor reported that 1,276 mu of fruits and 5,399 mu of cash crops were developed in 70 surveyed villages. The incremental annual product value was estimate at around CNY5,778,850. There was a total increase of 27,991 pigs, cattle, and sheep bred after land acquisition, which generated an annual income of CNY5,598,200. An additional 10,914 rural laborers were engaged in migrating labor jobs, and these workers have earned annual wages of around CNY65,484,000. Corporations have also been established to engage local women in production of weaving, embroidery, and other tourism souvenirs. In addition, local governments conducted many training programs for those laborers from affected households. According to the SPTD's project completion report, the average per capita annual income of affected households increased by 54%, from CNY1,089 in 2000 to CNY1,680 in 2006 (Table 11.4).

Table A11.4: Variation of Grain Output and Net Income of Affected Households

Item	Year	Grain Output	Net Income
		Per capita (kg)	Per capita (CNY)
Before Land Acquisition	2000	951	1,089
After Land Acquisition	2005	886	1,210
	2006	853	1,680
	2007	890	2,035
	2008	891	1,924 ^a

CNY = yuan, kg = kilogram.

^a = The income of affected households was decreased slightly in 2008 due to the financial crisis.

Sources: Shaanxi Provincial Transportation Department and Resettlement Plan.

9. The affected villagers have received house compensation funds and relocation allowances at the rates formulated in the resettlement plan and rebuilt their houses within the villages. Compared with before the project, the average per capita house area of affected households increased by 10.4% to 40.5 square meters (m²) after relocation. The percentage of brick-concrete houses increased from 29.2% to 96.4%. It is concluded that house conditions of affected households have been largely improved due to relocation. According to a sampling survey on 33 households conducted by the external monitor in Heyang and Fuping counties, 18 households spent complementary funds on their new houses in addition to house compensation, 11 households had funds left over after building new houses, and 4 households used all the

compensation funds to rebuild new houses. According to observation by the external monitor, the house compensation rates were deemed adequate for building replacement houses; around 50% of affected households constructed better houses without additional funds.

D. Land Acquisition and Resettlement Cost

10. The total actual cost of compensation for land acquisition, building relocation, and affected facilities was CNY642.90 million, an increase of 6.8% from the CNY601.81 million estimated in the resettlement plan. Table A11.5 provides details of the resettlement cost.

Table A11.5: Estimated and Actual Land Acquisition and Resettlement Cost
(CNY'000)

Item	Estimated Cost in RP	Actual Cost	Change (%)
A. Basic Costs	412,205	552,798	34.1
Land Compensation	69,710	126,400	81.3
Resettlement Subsidy	24,490	54,440	122.3
Land Acquisition Tax	120,510	74,000	(38.6)
Temporary Land Use	5,660	9,582	69.3
House Compensation	6,973	13,550	94.3
Other Buildings Compensation	2,820	8,010	184.0
Young Crop and Trees	88,040	134,610	52.9
Power and Telecom Facilities	90,800	124,100	36.7
Irrigation System	2,810	7,610	170.8
Relocation Allowance	117	124	6.0
Transitional Subsidy	137	122	(10.9)
Enterprises compensation	30	100	233.3
Enterprises Transitional Subsidy	108	150	38.9
B. Administration	12,366	10,000	(19.1)
C. Transaction Cost	12,366	10,000	(19.1)
D. Monitoring	1,031	1,130	9.6
E. Contingency	144,272	68,970	(52.2)
F. Others	19,569	0	
Total	601,809	642,898	6.8

() = negative, CNY = yuan, RP = resettlement plan.

Source: Shaanxi Provincial Transportation Department.

E. Institutional Arrangement

11. The resettlement offices established under the Shaanxi Provincial Xiyu Expressway Construction and Coordination Headquarters were responsible for coordination, fund raising, and internal monitoring and evaluation for land acquisition and resettlement. In addition to those at the provincial level, the Xi'an Municipal Government, Weinan Municipal Government, and six affected counties (Chengcheng, Fuping, Heyang, Pucheng, Hancheng, and Yanliang), and all affected townships along the alignment also established either resettlement offices or resettlement working groups, which were responsible for implementing land acquisition, house demolition, and relocation. External monitoring reports showed that institutional arrangements for land acquisition and resettlement were well organized, efficient, and transparent.

F. Monitoring and Evaluation

12. The Shaanxi Academy of Social Science was engaged as the external agency to conduct independent resettlement monitoring and evaluation (M&E) for the project. The academy prepared and submitted seven resettlement M&E reports for the expressway from 2001 to 2005, and three M&E reports for the local roads component from 2005 to 2007. In 2008, Chang'an University was engaged as an external monitor to monitor resettlement implementation of the additional local roads component and submitted an M&E report in January 2010. The Shaanxi Academy of Social Science and Chang'an University also assisted the SPTD in preparing and submitting the project completion report to ADB in 2009.

G. Participation and Information Disclosure

13. Extensive participation and full information disclosure throughout the entire process of the project cycles have contributed to efficient implementation of land acquisition and resettlement. Various stakeholders—including affected householders, affected villages, local government, and design institutes—participated in the process of formulating the resettlement plan, a detailed measurement survey, compensation fund delivery, as well as income rehabilitation programs. The information on the project and resettlement policy were widely disseminated and announced before and during project implementation. A total of 1,300 announcements were posted. Many consultation meetings were held during implementation among expressway construction headquarters, local governments, village committees, and the representatives of affected households to discuss issues including house plots allocation and house rebuilding, disbursement and distribution of compensation funds, and restoration of community facilities. A total of 13,000 participants attended various meetings. These timely announcements and consultations ensured that the process of land acquisition and resettlement was transparent. In addition, under the project an efficient grievance channel was established to address complaints received during resettlement implementation; 87 coordination meetings were held to address complaints from June 2002 to May 2005, according to an external report, and a total of CNY5.99 million was used to address those complaints.

H. Conclusions and Lessons

14. The SPTD and governments at various levels consulted extensively with villages, groups, enterprises, and people affected by the project due to land acquisition and house relocation. Throughout the process of land acquisition, house demolition, and relocation, affected groups and persons were able to report their difficulties and problems, and make complaints through grievance channels. All levels of government and various resettlement offices and working groups worked proactively to solve the problems reported by affected people. In addition, the SPTD and local governments also made great efforts to improve incomes for affected people by implementing income rehabilitation programs and providing skills training and job opportunities. According to external resettlement M&E reports and SPTD's project completion report, the average per capita income of affected people has increased significantly after land acquisition and resettlement.

15. The impacts of land acquisition and resettlement were not well estimated in the resettlement plan, which led to a 30% increase in the amount of land acquired and a 187% increase in the area of houses demolished. This was mainly because impacts induced by connecting roads, service stations, and temporary buildings had not been included in the resettlement plan. The project was processed in early 2000, but updating the resettlement plan is now a standard requirement which is stipulated in loan covenants.

SOCIOECONOMIC DEVELOPMENT AND POVERTY REDUCTION

A. Introduction

1. The project comprises the 176 kilometer (km) Xiyu Expressway and a local roads component. Construction of the expressway commenced in September 2001, and it opened to traffic in November 2005. The Xiyu Expressway traverses six poor and less-developed counties and districts in northeastern Shaanxi. Socioeconomic surveys during project preparation also identified improving access roads among rural poor areas as a high priority. Hence, a local roads component of about 627 km linking poor townships to expressway interchanges was also included in the project. Subsequently, in 2008, the local roads component was expanded to 1,605 km to cover more poor villages. A social impact analysis was conducted during project preparation. According to that analysis, the project would facilitate sustainable economic development and generate a sustainable poverty impact in the long, medium, and short terms. In the long term, the project expressway would serve as a main transportation artery between the northeastern region and the southwestern region of the People's Republic of China (PRC), promoting the development of the poor central and western regions. In the medium term, the expressway would remove road transport bottlenecks in the region, thereby facilitating the growth of major industries as well as smaller and more varied ones in the industrial sites throughout the project area. In the short term, the project would generate employment opportunities during the construction and operation phase.

B. Sustainable Socioeconomic Growth

2. Construction and operation of the project expressway have largely promoted regional socioeconomic development. Since the construction commenced and the expressway opened to traffic, the areas close to the expressway alignment have gradually attracted more and more enterprises, and subsequently the service sectors, including financial entities, commerce, and restaurants, also expanded in the areas. The expansion of such impacts, accelerated through construction of linking roads and access roads, has gradually reached remote poor areas in the region. The statistical data shows that socioeconomic conditions in the project area have improved rapidly in recent years. From 2001 to 2008, the per capita gross domestic product (GDP) growth in the counties and cities along the project expressway alignment ranged from 136.4% to 350.9% (Table A12.1).

Table A12.1: Socioeconomic Growth in Project Areas

County	Per Capita GDP (CNY)			GDP Growth (%)		
	2001	2005	2008	2001–2005	2005–2008	2001–2008
Baishui	2,911	4,696	6,950	61.3	48.0	138.7
Chengcheng	3,154	4,864	7,455	54.2	53.3	136.4
Dali	2,600	3,713	5,978	42.8	61.0	129.9
Fuping	1,982	3,295	5,442	66.2	65.2	174.6
Hancheng	5,114	13,295	23,060	160.0	73.4	350.9
Heyang	1,982	3,186	5,263	60.7	65.2	165.5
Pucheng	3,098	4,873	7,697	57.3	58.0	148.5

CNY = yuan, GDP = gross domestic product.

Sources: 2001, 2005, and 2008 Statistical Yearbooks of Weinan Municipality, Shaanxi Province.

3. The expressway has removed road transport bottlenecks in the project area, and facilitated the growth of major industries as well as smaller and more varied ones in the industrial sites throughout the project area. In recent years, due to labor shortages, rising land prices, and more severe environmental pressure, more and more enterprises and investments from the coastal areas have gradually transferred to inland areas. One of the major obstacles hindering the project region from attracting enterprises and investments was the poor transportation conditions. The project's timely construction has greatly facilitated the transfer of enterprises to the project area. According to the Fuping County Government, local industry has rapidly developed in recent years, and five industrial zones are being constructed. The contribution of industry to GDP has increased from 25% in 2006 to 32% in 2008. In addition, CNY4.38 billion in external investments has been attracted since the expressway opened; annual external investments have increased rapidly, from CNY383 million in 2006 to CNY2.13 billion in 2009. Consequently, 116 agreements on industry have been signed and enterprises have been constructed and opened in Fuping County. The growth in industries has not only contributed to local government revenues but also provided tremendous employment opportunities for both skilled and unskilled workers in the project area.

4. The operation of the project expressway and improvement of local roads have promoted agricultural development in the project area. The project area is one of the main bases in Shaanxi Province for the production of cash crops including cotton, fruits, peanuts, and Qingchuan cattle, and some local agricultural products—Baishui Apple, Pucheng Pear, Hangcheng Pepper—are exported. Since the expressway opened to traffic, average travel times from the project counties to Xi'an, the capital of Shaanxi Province, have been reduced by 28.6%–50.0% compared with those in 2005. In addition to the expressway, improved local roads have also reduced travel time and improved transportation quality from the fields to expressway interchanges. This has made local farmers' agricultural production more profitable, particularly for those farmers who engage in production of fresh fruits. It was observed that increasing number of farmers in the project area are planting fruits and other cash crops.

Table A12.2: Reduced Travel Time from Project Areas to Xi'an
(hours)

Route	2005				2008				Time Reduced (%)
	Small Vehicle	Medium Vehicle	Large Vehicle	Average	Small Vehicle	Medium Vehicle	Large Vehicle	Average	
Xi'an–Hancheng	3.75	4.17	5.0	4.31	2.25	2.50	3.0	2.58	(40.0)
Xi'an–Heyang	2.63	2.92	3.5	3.02	1.88	2.08	2.5	2.15	(28.6)
Xi'an–Chengcheng	2.25	2.50	3.0	2.58	1.50	1.67	2.0	1.72	(33.3)
Xi'an–Pucheng	2.25	2.50	3.0	2.58	1.28	1.42	1.7	1.47	(43.2)
Xi'an–Fuping	1.88	2.08	2.5	2.15	1.13	1.25	1.5	1.29	(39.9)
Xi'an–Baishui	2.63	2.92	3.5	3.02	1.88	2.08	2.5	2.15	(28.6)
Xi'an–Dali	3.00	3.33	4.0	3.44	1.50	1.67	2.0	1.72	(50.0)

Source: Shaanxi Provincial Transportation Department.

5. The project area is rich in tourist resources, and the opening of the Xiyu Expressway meets a basic condition for developing tourism. Famous tourist resources along the expressway alignment include the Qiao Mausoleum, Yellow River Wetlands, Sima Qian Temple, and Dangjia Village Traditional Folk Dwellings. The SPTD's project completion report shows that the opening of the Xiyu Expressway has had a positive impact on development of the local tourist industry in the project area. The number of visiting tourists has increased 10-fold since the expressway opened. For instance, the total number of tourists visiting the Yellow River

Wetlands was around 200,000, but by 2006 that figure was 1 million—a 400% increase. For the Dangjia Village Traditional Folk Dwellings, the tourism revenues reached CNY2 million in 2006, 50 times the level in 2000. Rapid expansion of tourism has created a large number of employment opportunities for local workers.

C. Poverty Reduction

6. With the rapid growth in socioeconomic indicators related to the project, and the increased fiscal revenue of the local governments, the standard of livelihood and incomes of local people have been significantly improved. This is particularly the case for the poor. According to statistics of the county governments from 2001 to 2008, the growth of farmers' per capita incomes ranged from 83% to 129% in those counties and cities (Table A12.3). It was also observed that the rates of growth from 2005 to 2008 (after expressway opening) were much higher than those from 2001 to 2005.

Table A12.3: Rural Per Capita Income in Project Areas

County	Rural Per Capita Income (CNY)			Income Growth (%)		
	2001	2005	2008	2001–2005	2005–2008	2001–2008
Baishui	1,073	1,448	2,466	34.9	70.3	129.8
Chengcheng	1,277	1,653	2,860	29.4	73.0	124.0
Dali	1,666	2,156	3,250	29.4	50.7	95.1
Fuping	1,508	1,922	2,945	27.5	53.2	95.3
Hancheng	1,792	2,179	3,972	21.6	82.3	121.7
Heyang	1,287	1,660	2,360	29.0	42.2	83.4
Pucheng	1,400	1,810	2,940	29.3	62.4	110.0

CNY = yuan.

Sources: 2001, 2005, and 2008 Statistical Yearbooks of Weinan Municipality, Shaanxi Province.

7. The incidence of poverty in the project area has been reduced significantly. The total number of people living in poverty in the seven counties and cities along the alignment decreased by 65%—from 355,418 in 2000 to 123,710 in 2008 (Table A12.4).

Table A12.4: Poverty Incidence in Project Areas

County	Poverty Population		Poverty Incidence Reduced (%)
	2000	2008	
Baishui	64,412	14,944	76.8
Chengcheng	91,940	54,188	41.1
Dali	86,280	29,820	65.4
Fuping	14,770	4,172	71.8
Hancheng	30,010	11,693	61.0
Heyang	39,826	6,638	83.3
Pucheng	28,180	2,255	92.0
Total	355,418	123,710	65.2

Source: Shaanxi Provincial Transportation Department

8. The project greatly promoted employment during construction. According to the SPTD's project completion report, the construction provided 3.13 million person-days of work, of which 2.08 million person-days went to unskilled local rural workers. Most local workers came from

poor households. With daily wages of CNY30, a total of CNY62.4 million was disbursed to local poor households during the entire construction period. In addition, the opening of the expressway and local roads has also generated a certain number of job opportunities. Around 700 staff have been recruited by the Yuxi Expressway Company, of which 420 are engaged in toll gate and logistics management; most of these workers come from the project area. It was also noted that, for every 1.5 km of local road, one local worker has been recruited for road cleaning, which has created more than 1,000 part-time local jobs. The employment opportunities generated by the project have greatly contributed to poverty reduction in the project area.

9. Locally procured construction materials and supplies also provided a great many employment opportunities in the project area. According to the project completion report prepared by SPTD, 0.96 million tons of steel, 3.55 million tons of cement, 0.82 million cubic meters of timber, 83,000 tons of asphalt, 22.9 million cubic meters of sand and stone, and construction materials were procured locally, which resulted in a large amount of income and job opportunities for local communities, particularly for the poor.

D. Labor Mobility and Social Protection

10. The regional economy in the project area has long lagged behind those of other regions in the PRC, and even other prefectures in Shaanxi Province. The agriculture sector made up the largest share of the local economy; the proportion of secondary and tertiary industries was quite low. Thus, there were very limited opportunities to absorb the surplus rural laborers; around 800,000 surplus rural laborers worked outside the region. With the opening of the Yuxi Expressway, local industrial growth is accelerating and increasing numbers of workers are being employed in local enterprises. This will significantly reduce the social costs in terms of separating family members and other social issues associated with migrating laborers.

E. Gender Development

11. The construction and operation of the project has greatly promoted gender development in the project area. The improved roads system enables women, particularly rural women, to enjoy easy access to better medical services. According to Shaanxi Provincial Health Department, 98.83% of pregnant woman delivered in hospitals, and the mortality rate of pregnant woman decreased to 0.042% in 2009. About 60% of staff recruited by the Xiyu Expressway Company are female, and they enjoy the same salary as male employees for similar job types. Women actively participated in poverty reduction programs including skill trainings and the local tourism industry, and the project has facilitated rapid improvement in local socioeconomic conditions. Increasing numbers of girls and women are working in local enterprises. Consequently, the project has contributed to improving women's empowerment, social standing, domestic conditions, education levels, skills, and income.

F. Monitoring and Evaluation

12. The Shaanxi Academy of Social Science was recruited as the monitoring agency to monitor the project's social and poverty impacts. Two monitoring reports on the poverty reduction impact were submitted to the Asian Development Bank (ADB). The social impacts and poverty reduction analysis was prepared along with SPTD's project completion report, and these were submitted to ADB in 2009. These reports concluded that the construction and operation of the project have greatly contributed to regional socioeconomic development, poverty reduction, and gender development.

G. Cultural Impacts

13. In the project environment impact assessment, 27 historical sites and remains—including a section of wall remains of the Wei dynasty, the ancient Shaoliang city remains at Hancheng, and other scattered sites—were located within 500 meters of the proposed alignment. To minimize any potential impacts to these cultural sites, the project detailed design was optimized to locate the alignment as far as possible from these sites. Local government endorsed the optimized design and the completed project expressway did not impose any adverse impact during its construction period.¹

H. Conclusions

14. The project has had significant impacts on regional socioeconomic development and poverty reduction, as evidenced by (i) significantly increased GDP and farmers' income in the project area, (ii) increasing numbers of external enterprises and investments being transferred into the project area, and (iii) increased employment opportunities and income for the poor during construction and operation.

¹ According to government regulations, any potential impact to cultural sites during construction would result in immediate halt to construction until excavation and mitigation measures were approved and completed. The project did not experience such a halt during construction.