ADB

Completion Report

Project Number: 42017-013
Loan Number: 2631
September 2017

People's Republic of China: Second Heilongjiang Road Network Development Project

Asian Development Bank

CURRENCY EQUIVALENTS

Currency unit – yuan (CNY)

		At Appraisal (22 April 2010)	At Project Completion (13 January 2016)
CNY1.00	=	$0.1465	$0.1636
$1.00	=	CNY6.8263	CNY6.1136

ABBREVIATIONS

ADB	–	Asian Development Bank
ARMP	–	annual road maintenance plan
AADT	–	average annual daily traffic
CPMS	–	comprehensive pavement management system
EIA	–	environmental impact assessment
EIRR	–	economic internal rate of return
EMDP	–	ethnic minority development plan
EMP	–	environmental management plan
FIRR	–	financial internal rate of return
GDP	–	gross domestic product
HPTAB	–	Heilongjiang Provincial Toll-Road Administration Bureau
HPTD	–	Heilongjiang Provincial Transportation Department
ICB	–	international competitive bidding
HPHB	–	Heilongjiang Provincial Highway Bureau
O&M	–	operation and maintenance
PRC	–	People's Republic of China
RAMS	–	road asset management system
SDAP	–	social development action plan
SEIA	–	summary environmental impact assessment
SEPP	–	soil erosion protection plan

WEIGHTS AND MEASURES

ha	–	hectare
km	–	kilometer
m^2	–	square meter
m^3	–	cubic meter
mu	–	Chinese unit of measurement (1 *mu* = 666.67 m^2)
pcu	–	passenger car unit

NOTE

In this report, "$" refers to United States dollars unless otherwise stated.

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CONTENTS

BASIC DATA

A. Loan Identification

1.	Country	People's Republic of China
2.	Loan Number	2631-PRC
3.	Project Title	Second Heilongjiang Road Network Development Project
4.	Borrower	People's Republic of China
5.	Executing Agency	Heilongjiang Provincial Transportation Department
6.	Amount of Loan	$ 200 million
7.	Project Completion Report Number	1665

B. Loan Data

1.	Appraisal	
	– Date Started	6 February 2009
	– Date Completed	12 February 2009
2.	Loan Negotiations	
	– Date Started	16 March 2010
	– Date Completed	17 March 2010
3.	Date of Board Approval	20 April 2010
4.	Date of Loan Agreement	02 July 2010
5.	Date of Loan Effectiveness	
	– In Loan Agreement	30 September 2010
	– Actual	05 November 2010
	– Number of Extensions	Two
6.	Closing Date	
	– In Loan Agreement	30 June 2015
	– Actual	13 January 2016
	– Number of Extensions	None
7.	Terms of Loan	
	– Interest Rate	Loan interbank offered rate(LIBOR) +0.60%
	– Maturity	25 years
	– Grace Period	5 years
8.	Terms of Relending	
	– Interest Rate	Loan interbank offered rate(LIBOR) +0.60%
	– Maturity	25 years
	– Grace Period	5 years
	– Second-Step Borrower	Heilongjiang Provincial Government

9. Disbursements

a. Dates

Initial Disbursement	Final Disbursement	Time Interval
15 November 2010	14 September 2015	58 months
Effective Date	**Original Closing Date**	**Time Interval**
05 November 2010	30 June 2015	56 months

b. Amount ($ million)

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Disbursed	Undisbursed Balance
1. Works – Road Construction	181.90	195.90	195.90	0.00
2. Training/Consulting Services				
2A. Training	0.25	0.25	0.00	0.25
2B. Consulting Services	0.85	0.85	0.79	0.06
3. Interest and Commitment Charge	17.00	3.00	3.00	0.00
Total	**200.00**	**200.00**	**199.69**	**0.31**

C. Project Data

1. Project Cost ($ million)

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	98.81	199.69
Local Currency Cost	899.34	782.85
Total	**998.15**	**982.54**

2. Financing Plan ($ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	359.38	340.90
ADB Financed	183.00	196.69
Other External Financing	383.27	421.96
Total	**925.65**	**959.55**
IDC Costs		
Borrower Financed	19.07	19.99
ADB Financed	17.00	3.00
Other External Financing	36.43	0.00
Total	**72.50**	**22.99**

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

3. Cost Breakdown by Project Component ($ million)

Component	Appraisal Estimate	Actual
A. Investment Costs		
1. Road civil works		
a. Road sections		
i. Expressway	468.87	571.26
ii. Class I road	41.15	47.25
iii. Class II road	78.91	99.11
b. Others	94.40	118.08
2. Road maintenance works	50.00	7.29
3. Bus station works	0.88	0.87
4. Consulting services	16.02	1.48
5. Equipment and installation	26.17	18.64
6. Resettlement	45.32	42.45
7. Project management	40.23	53.12
Total Base Cost	**861.95**	**959.55**
B. Contingencies		
1. Physical	44.42	0.00
2. Price	19.28	0.00
Subtotal (B)	**63.70**	**0.00**
C. Financing Charges during Construction		
1. Interest	72.09	22.59
2. Commitment charges	0.41	0.40
Subtotal (C)	**72.50**	**22.99**
Total Project Cost (A+B+C)	**998.15**	**982.54**

4. Project Schedule

Item	Appraisal Estimate	Actual
Date of Contract with Consultants	30 June 2010	13 September 2010
Civil Works Contract		
Date of Award	31 December 2009	5 March 2010
Completion of Work	30 June 2013	28 September 2012
Equipment and Supplies		
Dates		
First Procurement	31 March 2011	20 August 2010
Last Procurement	30 June 2012	3 August 2011
Completion of Equipment Installation	31 December 2013	10 October 2012
Start of Operations		
Completion of Tests and Commissioning	31 December 2013	15 October 2012
Beginning of Start-Up	31 December 2013	30 October 2012

5. Project Performance Report Ratings

	Ratings	
Implementation Period	**Development Objectives**	**Implementation Progress**
From 30 April 2010 to 31 December 2010	Satisfactory	Satisfactory
From 1 January 2011 to 31 December 2011	Satisfactory	Satisfactory
From 1 January 2012 to 31 December 2012	Satisfactory	Satisfactory
From 1 January 2013 to 31 December 2013	Satisfactory	Satisfactory
From 1 January 2014 to 31 December 2014	Satisfactory	Satisfactory
From 1 January 2015 to 13 January 2016	Satisfactory	Satisfactory

D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members
Fact-finding Mission	1–9 June 2008	6	40	a, b, c, d, g
Appraisal Mission	9–11 December 2009	4	9	a, h
Inception Mission	15–18 November 2010	3	12	b, d, g
1st Loan Review Mission	23–27 May 2011	1	5	a
2nd Loan Review Mission and Hand-Over Mission	10–14 October 2011	4	20	a, g
3rd Loan Review Mission	18–25 June 2012	4	32	a, d, e, f
Midterm Loan Review Mission	22–28 April 2013	4	24	a, c, d, g
4th Loan Review Mission	15–19 December 2014	1	5	a
5th Loan Review Mission	14-16 December 2015	1	3	a
Project Completion Review	14–18 November 2016	4	16	a, c, d, g

a = engineer, b = economist, c = environment specialist, d = resettlement specialist/consultant, e = procurement specialist, f = control officer, g = analyst, h = counsel.

I. PROJECT DESCRIPTION

1. Heilongjiang is a landlocked province in the extreme northeast of the People's Republic of China (PRC) that borders the Inner Mongolia Autonomous Region in the west and the Russian Federation in the north and east. In 2010, Heilongjiang's per capita gross domestic product (GDP) was CNY 27,076, 12.3% below the national average. Improving basic infrastructure, especially the road network and road conditions in the province was an important part of this strategy. To this end, Heilongjiang province approved a 3-year plan to speed up road development in 2008–2010. By the end of 2010, the total length of roads in Heilongjiang province was 151,563 kilometers (km), consisting of 2,053 km of expressways, 1,085 km of class I roads, and 8,915 km of class II roads.[1] 96.3% of townships in the province had all-weather road access. Moreover, with the road network concentrated mainly around Harbin,[2] there were missing links and bottlenecks in the network. Particularly, the lack of a transport corridor between the northeast and the northwest parts of the province restricted the development of freight transport and tourism. Inadequate road access was also an impediment to higher agricultural productivity and prevented access to tourism destinations and job opportunities in towns. While the road length increased, road condition had deteriorated due to aging and lack of adequate maintenance. The province had a great need for a systematic approach to updating the road database and road maintenance planning, and for road maintenance capacity building. The unsafe traffic environment in rural areas also called for more attention on road design, traffic safety devices, knowledge of traffic regulation, and timely and effective emergency rescue mechanisms. Rural transport services for passengers in remote villages with small population were inadequate. The unregulated rural bus service providers did not provide a safe, convenient, and comfortable transport for people between villages and townships.

2. The principal objectives of the project were to promote sustainable economic growth and reduce poverty in Heilongjiang province, particularly, the project area. The project, as designed, would (i) build a missing link to improve the Heilongjiang road network for better connectivity and efficiency; (ii) enhance regional economic cooperation and development among different parts of Heilongjiang province; (iii) improve connectivity and accessibility for local communities and poor areas and provide them with opportunities for poverty reduction; and (iv) promote regional tourism development. The project design and monitoring framework is in Appendix 1.

3. The Heilongjiang Provincial Transport Department (HPTD) prepared the project feasibility study in 2008. The Asian Development Bank (ADB) approved a project preparatory technical assistance (TA) in August 2008 to review and assess the project's technical feasibility and financial viability, including its environmental and resettlement impact. The TA was completed in September 2009, and its outcome confirmed the technical, financial, and economic viability of the project and the adequacy of its environmental and social measures. Subsequently, the loan fact-finding mission verified compliance with ADB's country partnership strategy.[3] The government approved the study in June 2009. ADB's Board of Directors approved a loan of $200 million on 20 April 2010. The loan was declared effective on 05

[1] PRC road standards include expressways and 4 classes of roads. Expressways are multilane, high-speed national highways. Class I roads are multilane national and provincial highways; Class II roads are two-lane main roads; Class III roads are two-lane roads, mostly used for local connections; Class IV roads are two-lane or single-lane feeder roads.

[2] Harbin is the capital and largest city of Heilongjiang province.

[3] ADB. 1997. *Country Operational Strategy Study: People's Republic of China*. Manila; ADB. 2001. *Country Strategy and Program Update: People's Republic of China, 2002–2004.* Manila.

November 2010 and was closed on 13 January 2016. Appendix 2 provides a chronology of major events.

II. EVALUATION OF DESIGN AND IMPLEMENTATION

A. Relevance of Design and Formulation

4. ADB's country partnership strategy (2008-2010) for the transport sector in the PRC at the time of appraisal (2009) supported (i) the construction of roads connecting major coastal growth centers with the interior regions; (ii) the integration of the road network so that the national trunk highway system would be supported by a system of local roads, in particular, roads providing access to poor areas; (iii) the promotion of road safety; (iv) institutional strengthening to increase the financial and managerial efficiency of expressway operations; (v) the adoption of appropriate pricing policies to optimize road transport capacity; and (vi) the use of alternative methods of investment financing.

5. The project was designed to support the government's strategy for developing the northeastern region, as set out in the Eleventh Five-Year Plan,[4] 2006–2010, by providing a link from Qianfeng Farm to the provincial border with Inner Mongolia. This was a corridor for supporting economic growth, fostering domestic and international trade, facilitating inter-regional integration, and reducing poverty. It supported the government's northeast revitalization strategy to stimulate economic growth inside and outside the region. The project was consistent with ADB's strategy for the road sector in the PRC as it aimed to supply 347.06 km highway and expressway from Qianfeng Farm to Nenjiang, creating an east-west corridor in the north of the province. The expressway would reduce the journey time between Qianfeng Farm and Nenjiang by 6 hours, thus offering a considerably faster and safer alternative. By lowering transport costs, enhancing the frequency and quality of transport services, driving tourism, and improving access to more developed cities and towns, the project was expected to spur economic activity and interregional trade, and reduce poverty in the project area.

6. Although the project was one of the last highway projects financed by ADB in the PRC, the project helped the PRC boost development in underdeveloped areas through the provision of improved road networks. Revitalizing northeast region was an important government priority, and developing the regional transport was an important component of this program. Besides contributing to the construction of the road network ADB provided value added through helping develop the road maintenance system for the province and provision of bus services to the rural areas.

B. Project Outputs

7. At appraisal, the project outputs included (i) 347.06 km of improved road infrastructure in the provincial East–West 2 corridor, (ii) improved road maintenance in the province, (iii) improved bus services in Bei'an City, and (iv) strengthened institutional capacity. All the outputs were *achieved*.

[4] PRC's FYPs are blueprints which outline key economic and development targets for the country for the next five-year period.

1. Improved road infrastructure

8. The project component comprised a 206.26 km four-lane expressway construction between Yichun and Wudalianchi (163.67 km between Yichun and Bei'an East and 42.59 km between Bei'an West and Wudalianchi), a 127.92 km gravel road upgrade between Longzhen and Nenjiang to class II highway, a new 12.88 km class I road construction between Nenjiang and the provincial border with Inner Mongolia including the extra-large Nen River Bridge with a total length of 766 meter, construction of three class I and III branch roads of 4.33 km. No road sections were realigned. Along the project roads, five service areas, six toll stations, and three parking areas were constructed. The procurement of 23 packages was conducted in 2010 through international competitive bidding (ICB), and five of them used advanced contracting. Construction of the Yichun-Bei'an section started in June 2010, construction of the Bei'an West-Wudalianchi section started in October 2009, and the Longzhen-Nenjiang section started in April 2010. The equipment for the project roads was installed on time using domestic funding. All sections were opened to traffic in October 2012, except for the Longzhen-Nenjiang section, which opened one month earlier than the others, in September 2012.

9. The project expressway and highway include seven interchanges, 43 overpasses, 397 culverts, 27 large and super-large span bridges, and 34 medium-span bridges, all of which met prescribed national and international standards. During project implementation, the participating institutions and local universities conducted 11 technical studies in the field, such as frozen soil highway roadbed design and construction research, temperature crack control measures study, applied technology research for highway water environment protection in an ecologically sensitive area of a cold region, etc. The outputs of the studies were shared within projects managed by HPTD and the Heilongjiang Provincial Highway Bureau (HPHB).

2. Improving road maintenance

10. This component of the project comprised (i) the introduction of the road asset management system (RAMS) to support road maintenance planning and budgeting, (ii) implementation of the government-funded priority road maintenance program for an estimated $50 million, and (iii) introduction of performance-based maintenance contracts on a pilot basis for road maintenance works.

11. Two consulting contracts were included to serve this component. Assisted by the international consultants, the preparation of the RAMS subcomponent started in 2010 and the initial traffic and road inventory data collection for RAMS was completed in 2010. RAMS was successfully introduced to HPHB in 2011 and has prepared annual road maintenance reports based on priority works and maintenance budget since then. A total of $50 million road maintenance work has been completed with the help of RAMS. The road maintenance planning and budgeting procedure has made a significant difference with the adoption of RAMS. HPHB had been using performance-based maintenance contracts for the overhaul and daily maintenance of several sections of the highway. However, the full-scale implementation of RAMS cannot be implemented because of the publication by the Ministry of Transport (MOT) in 2015 of an exposure draft policy to realign road maintenance management structure in highway bureaus. The current road maintenance realignment proposal was restrained by the general reforms of MOT.

3. Improving rural village bus services

12. This project component comprised (i) the introduction of user needs-based bus services in the three villages of Bei'an City by implementing a pilot project for bus route licensing reform, and (ii) construction of 16 new bus stations and rehabilitation of four bus stations in four counties and three prefectures. The pilot project introduced a user demand-based bus service and achieved a safer and more reliable rural bus service in the pilot town and villages.

13. Upon consultant's mobilization in May 2011, a Pilot Project Secretariat (PPS) was set up in Bei'an on 10 June 2011. The PPS with help of consultants selected one town and three villages to the pilot. The final locations of the bus stations were adjusted from the original plan based on requests from the local community and the provincial rural village bus services plan. The civil works of the bus stations were completed at the end of 2012 and the stations began operations in January 2013. The rural bus services and stations were significantly improved, which provided residents with more comfortable and safer facilities.

4. Strengthening Institutional Capacity

14. **Consulting services.** The institutional capacity of HPTD and HPHB was further strengthened through provision of consulting services and training during the project implementation. ADB financed a total of 37.86 person-months consulting services, consisting of 15.61 person-months for implementation supervision, 6.25 person-months for improving road maintenance, 2 person-months for RAMS, and 14 person-months for improving the rural bus service. The international RAMS specialist was recruited in a timely manner and mobilized on 17 November 2010. Selection of the other consultants was delayed by 1 year, mostly due to delays in revising the technical proposal evaluation reports by China International Tendering Company (CITC). The international implementation supervision consultant began work for the project in May 2011. The national consultants for the rural village bus services pilot commenced on 23 May 2011. All the consulting services were provided as required and the project management office (PMO) confirmed their performance as *satisfactory*. The implementation supervision's consulting service was extended by 1.61 person-months to provide high-quality service reports.

15. **Training.** The project's RAMS and annual road maintenance plan (ARMP) were used to maintain the local roads in Heilongjiang province. This enabled knowledge transfer from the project to the operational staff in HPHB and the local highway bureaus. The rural bus consultants provided high-quality work, the local bus services were enhanced and the institutional capacity strengthened. As of November 2016, all 14 domestic training programs that were developed and included in the training plan were implemented and involved 2,250 person-days participants. The training covered (i) construction management, (ii) rural village bus services and management, (iii) bridges and road maintenance by contractors, (iv) road asset management, (v) traffic control and road emergency relief, (vi) road safety and traffic regulation, (vii) rural traffic safety, (viii) expressway toll collection and operation, (ix) winter road maintenance and emergency plan, and (x) operation of highway systems. ADB loan funded all overseas training and the in-house training on RAMS, road maintenance, and rural village bus services. Three overseas study tours on road and bridge construction technology, road maintenance, and asset management system were conducted in 2012–2015. The trainees included leaders and staff from HPTD and HPHB, who visited overseas locations and attended seminars to discuss advanced highway design and management concepts, rural bus service, and learn about best practice. Participants benefited from these development opportunities, resulting in improved decision making and implementation of the projects.

C. Project Cost

16. The project cost was 1.56% lower than estimated; $982.54 million against estimated $998.15 million. The undisbursed funds related to training and consulting services and were canceled after project completion. The cost reduction included (i) cost adjustment at preliminary design and detailed design, (ii) price escalation for materials and labor, and (iii) change in exchange rates. The project financing plan was also adjusted. The counterpart fund contribution reduced from $798.15 million (80%) to $782.85 million (79.7%). The ADB loan was reduced from $200 million to $199.69 million. The project cost and financing plans are in Appendix 3.

D. Disbursements

17. The disbursement schedule set at appraisal was generally followed. A total of $199.69 million was disbursed during 2010–2015. Three types of disbursement procedures were followed, including imprest fund and reimbursement procedure for civil works, direct payment for consulting services and equipment. Disbursement control procedures were satisfactory. A total of $195.90 million was spent on civil works for road construction, $0.79 million on training and consulting services, and $3 million was capitalized to cover interest during construction and commitment charges. The loan closing date was 30 June 2015, and the loan account was closed on 13 January 2016. Projected and actual contract awards and disbursements are set out in Appendix 4.

E. Project Schedule

18. The project implementation generally followed the implementation schedule at appraisal. The advanced procured contracts were signed from April 2009 to November 2010. The expressway construction of Bei'an West to Wudalianchi (Longzhen) began in October 2009 by advanced contracting, Longzhen to Nenjiang started in April 2010, and Yichun to Bei'an in June 2010. Effective measures were taken to secure the completion of the project roads. The Longzhen to Nenjiang section opened in September 2012 while the other road sections opened to traffic in October 2012. The construction of 16 new bus stations and the rehabilitation of four bus stations were all completed by 2015. The appraisal and actual project implementation schedules are in Appendix 5.

F. Implementation Arrangements

19. HPTD, the executing agency, was responsible for the overall implementation of the project. It established the PMO, which was the implementing agency for the construction of project roads (component A) and the implementation of project components C and D. Headed by a project manager, the PMO oversaw the day-to-day implementation and provided construction supervision and quality control. Within the PMO, a PPS formed by the Bei'an City transport bureau was responsible for the implementation of rural village bus services pilot project. HPHB was the implementing agency for project component B. A project implementing unit under HPHB was responsible for the activities of improving road maintenance. The PMO conducted on-the-job training and study tours and participated in other training programs.

20. The expressway and class I roads have been operated and managed by the Toll Roads Administration Bureau under HPTD, while the class II roads have been maintained by HPHB. The project organization charts are in Appendix 6.

G. Conditions and Covenants

21. All covenants were relevant. No covenants were modified or waived during implementation. All loan covenants due were complied with or were being complied with at June 2015. However, based on the current financial analysis, HPTD is not expected to be able to comply with the debt service coverage ratio covenant of 1.00 in the first two years of operation and 1.20 thereafter, resulting from the lower traffic volume and toll revenue in the early years of operation. Compliance with such covenant demands the support of the Heilongjiang Provincial Government and HPHB by the revenue generated from the other expressways in the province. The Heilongjiang provincial audit office audited the project accounts and financial statements and the audited reports were submitted on time. The reports were useful in identifying and addressing issues and weakness in project implementation. Compliance with the loan covenants is set out in Appendix 7.

H. Consultant Recruitment and Procurement

22. ADB financed the international consulting services for construction supervision and road maintenance, and national consulting services for rural bus service improvement. The international RAMS specialist was timely recruitly and mobilized in Novermber 2010. Selection of the two consulting firms was delayed for about one year. The international consulting firm for construction supervison commenced services on 21 May 2011 and the national consultants for piloting rural village bus services mobilized on 23 May 2011. The national consultants for design, construction supervision, and procurement were recruited on time and financed by the government following national procedures acceptable to ADB.

23. International competitive bidding (ICB) procedures were used to procure civil works for the project. All 23 ICB contracts were awarded in 2010. Relevant sections of ADB's Anticorruption Policy were incorporated into the bidding documents and contracts and complied with. Contracts for equipment were all financed by the counterpart fund. The project's contract packages are shown in Appendix 8.

I. Performance of Consultants, Contractors, and Suppliers

24. The international and national consultants engaged to assist with project implementation performed satisfactorily and established good working relationships with HPTD and HPHB. They provided the required services in accordance with the terms of reference. The consultants for improving road maintenance completed the assignment per the terms of reference, and the staff have gained knowledge and enhanced their skills. The rural bus service consultants performed well during the pilot program in line with the contracts. Environmental management plan (EMP), resettlement plans, and social development action plan (SDAP) were prepared in a timely manner in accordance with ADB's requirements. The environmental monitoring conducted by the national consultants during construction was *satisfactory*. The civil works contractors performed well and completed the construction on schedule and as stipulated in their contracts. The domestic design institute designed the expressway, incorporating prevailing international practice. The civil works for the expressway, comprising bridges and pavement, were well implemented and of satisfactory quality. Operation and maintenance (O&M) equipment was supplied, installed, and commissioned as scheduled. Overall, the performance of the consultants, contractors, and suppliers was *satisfactory*.

J. Performance of the Borrower and the Executing Agency

25. HPTD and HPHB implemented the project effectively and efficiently. Project management during the preparation and construction phases was efficient and effective. Construction and maintenance of the expressway conformed with international standards. A systematic project management system was put in place to ensure the effective use of funds. The procurement activities were completed ahead of schedule. Domestic funds were mobilized on time. The withdrawal applications for ADB loan proceeds were timely submitted and contractors were promptly paid. The land acquisition and resettlement activities were completed on time and to the satisfaction of the people affected. The assessment of the executing agency's capacity at appraisal was reasonably accurate.

26. The implementation of institutional strengthening and capacity development programs has effectively enhanced the capacity of HPTD and HPHB in technical and management aspects. The measures designed at project appraisal for institutional development were competent and successful. The training provided by the consultants and the international study tours greatly enriched the institutional capacity of the HPTD and HPHB's staff. Overall, the performance of the borrower and HPTD was *satisfactory*.

K. Performance of the Asian Development Bank

27. ADB conducted regular loan review missions during project implementation and provided effective advice to HPTD and HPHB on project implementation, monitoring, and procurement. ADB reviewed and processed procurement documents efficiently. ADB processed the borrower's and HPTD's requests promptly. Withdrawal applications were processed and disbursed on time. Training on project implementation by ADB was adequate and timely. HPTD and HPHB expressed satisfaction with the transfer of project administration to ADB's PRC Resident Mission, which facilitated closer and more efficient communication. ADB performance during project implementation was assessed as *satisfactory*.

III. EVALUATION OF PERFORMANCE

A. Relevance

28. The project was *relevant*. The project was considered a critical part in the government's northeast revitalization strategy, as it completed an important missing link between the northeast and northwest of Heilongjiang province. As such it helped develop one of the country's under-developed rural regions and reduced poverty. The project achieved its objectives by (i) reducing the number of road accident fatalities per 10,000 vehicles in Heilongjiang to 5.56 by 2015; (ii) decreasing the travel time between Yichun and Nenjiang by 6 hours; (iii) reducing the travel distance between Yichun and Bei'an by about 400 km by 2015, delivering fuel savings of 200.06 million liters and a carbon dioxide (CO_2) emission reduction of 0.589 million tons for the 20-year operating period; and (iv) constructing and rehabilitating 347.06 km of roads. It helped increase the per capita annual net income of rural residents in the project area from CNY3,350 in 2008 to CNY11,389 in 2015, and reduce the poverty incidence from 8.6% in 2008 to 3.29% in 2015.

29. Although it was one of the last highway projects financed by ADB in the PRC, the project was consistent with ADB's strategy for PRC transport sector (2008-2010) at appraisal and the ADB's country partnership strategy.

B. Effectiveness in Achieving Outcome

30. The project was *effective* in achieving its intended outcome. The outcome envisaged at appraisal—a more resource-efficient, safe, and environment-friendly road transport system in Heilongjiang province—was substantially achieved. When it opened in 2012, the expressway connected Yichun to Wudalianchi, a tourism spot, and to Nenjiang, on the border. The better transport conditions and the shorter distances have brought great convenience to the people living along the project highways and attract more tourists to Wudalianchi. Although, the annual average daily traffic on the project expressway in 2015 was lower than projected at appraisal,[5] the expressway allowed safer, more efficient movement of passengers and freight at lower cost. The travel time was significantly reduced by 6 hours in 2015. People living in Yichun could now travel to Nenjiang directly, rather than transferring via Harbin or Suihua in the south. The original distance from Yichun to Nenjiang, more than 800 km, was reduced to 434 km. After the opening of the project expressway and the improvement in the highway and road condition, CO_2 emissions were reduced by 212,528 tons in the first year of operation. Emissions of pollutants sulfur dioxide (SO_2) and nitrogen dioxide (NO_2) will also decline during operation. The implementation of comprehensive transportation safety engineering has resulted in a substantial fall in the number of serious road accidents and fatalities on the expressway. Between 2012 and 2015, there were only 6 accidents, 3 fatalities and 7 injuries, compared with 138 accidents, 43 fatalities and 126 injuries in 2007. Thus, the road conditions have largely improved.

31. The improved branch roads provided easier access for people and goods, thereby improving access to markets and social services, and increasing income opportunities from tourism. This contributed to poverty reduction in the region. The rehabilitated and newly built bus stations and improved bus services benefited the villagers. With the implementation of the pilot bus projects, bus fare and routes have been adjusted to better meet the travel demands of the local population. Meanwhile, tourism revenues from 2012 to 2015 increased by 75% and 41% in Wudalianchi and Bei'an, respectively.

C. Efficiency in Achieving Outcome and Outputs

32. Based on the economic and financial re-evaluation, the project is rated *efficient* in achieving the outcome and outputs. The reevaluated economic internal rate of return (EIRR) for the project, at 12.8%, is lower than the 17.79% estimated at appraisal. The lower EIRR, which was mainly due to the lower traffic volumes, was partly offset by the higher unit rates of vehicle operating cost (VOC) savings and time savings. Moreover, the reevaluated EIRR is higher than the cut-off rate of 9%, and the project is still considered economically viable. Sensitivity analysis was carried out to test the impacts of (i) an increase in operation and maintenance costs, (ii) a decrease in benefits, and (iii) both combined. The main results of these sensitivity analysis were shown in Appendix 9 with the supporting assumptions.

D. Preliminary Assessment of Sustainability

33. The recalculated financial internal rate of return (FIRR) is -5.4%. This compares with the appraisal estimate of 7.3%. This reflected mainly lower-than-forecast traffic volumes and toll revenues. The FIRR is based on a recalculated weighted average cost of capital (WACC) of 2.7%, which is lower than the appraisal estimate of 3.6%. This was calculated using the actual capital mix and cost of various financing sources, i.e., ADB loan interest rate based on a 10-

[5] 5,866 passenger car unit (pcu) for Yichun–Bei'an East (9,603 pcu at appraisal), 6,190 pcu for Bei'an West–Wudalianchi (10,655 pcu at appraisal), and 4,897 pcu for Nenjiang–Border (5,105 pcu at appraisal).

year fixed swap rate, domestic loans at an interest rate of 4.9%, and the cost of the grant of 8%. The negative FIRR indicates that the project needs government's input to cover the shortage of cash flow to ensure the sustainable repayment of the loan for the tolled highways. The covenanted debt service coverage ratio could not be complied with. In view of the low financial return of the project, HPTD committed to ensuring it can meet debt repayments of ADB loan, closely monitor the financial performance of project roads, and take necessary actions, including adjusting the toll levels. The financial reevaluation is in Appendix 10. The recalculated FIRR is subject to some upside risks, as the calculations do not reflect the potential impact of new projects connecting the PRC and the Russian Federation at Heihe that started construction in December 2016 and will open October 2019. This could lead to growth in tourism and international trade, which would generate more traffic volume for the project expressway.

34. Even though the project has a lower-than-expected financial rate of return, the project is *likely sustainable*. The completion of the project roads has created a significant corridor in the north Heilongjiang province, improved the efficiency of road transport services, and provided convenient and safer direct road access to poorer remote villages in the project area. Since the opening of the project roads, a significant amount of traffic was generated from the remote poor forest farms to connect with the more developed cities and scenic spots. The integrated road network has contributed to higher GDP growth and tourism revenues and poverty reduction through robust economic growth. Continued economic growth, assisted by the completion of the transport corridor between Yichun and Nenjiang, will ensure a steady income from toll revenues for HPTD and HPHB to manage the expressway, bringing positive economic and social development to the project area. Although the current traffic volume and toll revenue are lower than expected, sufficient financial support from the provincial government and HPHB is guaranteed, which will ensure the highway to be well operated and timely maintained. HPHB is responsible for operating and maintaining all expressways and class I highways (toll roads) in Heilongjiang province. Over 4,300 km toll roads are now under administration of HPHB, of which financial performance as a whole is robust. HPHB has sufficient financial capacity to repay the loan and maintain a lower debt service coverage ratio. In addition, the traffic volume is expected to increase as tourism and international trade expand once the Heihe Bridge and other infrastructure projects are completed by 2019.

35. The physical sustainability of the expressway was ensured by using sound engineering technology in its construction, which met prevailing international standards and by the well-developed technical capacity of HPTD and HPHB. The project expressway passes through some geotechnically and climatically complex terrain, but HPTD and HPHB initiated 11 technical studies to cope with various technical difficulties and challenges. The application of these technical research products to the expressway's construction generated significant social and economic benefits. HPTD and HPHB will continue practicing good management and sound financial administration.

36. The central government, HPTD, and local governments are committed to developing and maintaining the road network. In April 2016, the state council issued a policy[6] aiming to speed up the rejuvenation of northeast PRC through government institutional strengthening, promotion of state-owned enterprises, and participation in the belt and road construction. This will be a great opportunity for northeast PRC to further enhance infrastructure construction, border trade, and economic cooperation. HPTD and the provincial government have committed to respond to the government's call with proactive sustainability measures for the road network in the province. This commitment and the priority assigned to infrastructure development, with steady budget

[6] 2016. State Concil of PRC. *Comprehensive Revitalization of Northeast China and Other Old Industrial Bases Policy*.

support and multilevel input, will ensure the sustainable development of the road network and provide remote and poor areas with easier access and greater connectivity.

E. Impact

37. The impact of the project is *satisfactory*. The project construction has contributed to regional socioeconomic development in the project area. Investments of CNY6.7 billion in the project area in 2010–2012 contributed to local economic development, via the supply of construction materials as well as a boost to the services sector. The statistical data show that socioeconomic conditions in the project area have improved rapidly in recent years. From 2009 to 2015, the average annual growth rates of the gross domestic product reached 11.1% and the government fiscal revenues growth rates in project areas reached 9.1%. The construction and operation of the expressway have helped local governments attract external investments to contribute to local industrial development along the expressway. More enterprises have started or expanded operations along the expressway alignment since the project roads opened. For example, Bei'an City attracted a total of CNY6.77 billion in external investments[7] in 2015. External investments in the project area have increased by an average of 42.7% annually from 2009 to 2015. The establishment of more enterprises has played an important role in providing employment to local people. In addition, the opening of the expressway in 2012 provided the basic link between two tourism cities, which means that the tourists of Yichun City can travel to Wudalianchi City directly. The statistics show that tourism incomes in Wudalianchi City have increased by 76%, the Wudalianchi Scenic Spot by 74%, and Yichun City by 41% from 2012 to 2015.

38. The socioeconomic growth and increased employment opportunities in the project area have improved the living standards and income of local residents, particularly the poor. The growth of farmers' per capita incomes ranged from 94% to 125% in the project area from 2009 to 2015. A trend analysis of rural income growth in the counties/districts along the expressway indicates that the rural income growth in poor counties, such as Suiling, was higher than others, except for Bei'an City, gradually balancing development in the project area. In addition, the poverty incidence has also declined. Local employment was promoted during project construction. According to the external monitor, project construction provided work for 28,832 person-days of labor, of which 23,636 person-days came from the local labor market. Among the local employment, 4,376 person-days (19%) of work went to female workers. Daily wages grew from CNY60 to CNY100 from 2010 to 2012. Moreover, locally procured construction materials and supplies also provided some job opportunities.

39. The project expressway permanently acquired 20,361 *mu* (1,357.4 ha) of land, 1.3% more than in the updated resettlement plan. A total of 1,316 square meters (m^2) of houses was demolished, 32% less than in the updated resettlement plan. A total of 2,600 households were affected by land acquisition and a total of 18 households had their houses demolished. The actual compensation rates of land acquisition were similar with those in the updated resettlement plan, while the compensation rates for houses were higher than those in the resettlement plan, which resulted in a 27.0% increase of total resettlement cost. The details of land acquisition and resettlement are shown in Appendix 11.

40. The project expressway improved rural living conditions by giving communities more reliable and rapid access to outside products, services, information, and social links; and by allowing external services, product providers and social contacts to have improved access to

[7] A standard indicator of government report, means all those investments from outside of its administrative region.

rural communities along the alignment. The project significantly spurred regional social development and poverty reduction as evidenced by (i) contribution to the growth of gross domestic product, governments' fiscal revenues, as well as poverty reduction, (ii) reduced travel time and improved mobility of local people, (iii) job creation during expressway construction and operation, (iv) facilitation of tourism development in Wudalianchi Scenic Area and Yichun forestry area and creation of new employment opportunities for local forest workers, and (v) improved gender and ethnic minority development. The social impact and poverty reduction report is in Appendix 12.

41. In line with ADB's environmental safeguards policy, the project was classified as category A for the environment. The summary environmental impact assessment (SEIA) report circulated to ADB in September 2009 was prepared based on information contained in the approved domestic environmental impact assessment (EIA) and soil erosion protection plan (SEPPs). An environmental assessment and review framework was prepared for the selected road rehabilitation subprojects. The SEIA concluded that the anticipated adverse environmental impacts of the project would be minimized to acceptable levels by implementing credible and timely environmental mitigation and monitoring programs as stipulated in the EMP.

42. Environmental and soil erosion control specification clauses were included in the contract signed between implementing agencies and contractors during construction. Guidelines were set for the acquisition of temporary occupied land, transportation, and storage of waste materials. During project preparation, including preliminary preparation and detailed design, the alignment of the project expressway was carefully screened, considering the ecological and socioeconomic environment. The engineering design was improved to minimize environmental impacts.

43. Ten semi-annual environmental management reports were provided by the project management office to ADB and uploaded on the ADB website. During construction and operational period, the EMP and SEPP were implemented effectively. The monitoring results showed no significant environmental damage during project construction and operation. And no complaints were received by the PMO.

44. During implementation, environmental monitoring and mitigation measures were carried out according to the EMP and the SEPP. The following measures minimized adverse environmental effects (i) reusing 5.54 million cubic meters (m^3) of spoil from tunnels and other excavations for embankment filling; (ii) minimizing excavation and potential erosion by optimizing the design of bridge substructures; (iii) applying integrated revegetation and structural methods to recover 7.94 million m^2 of cutting slopes and embankments; (iv) rehabilitating 21 borrow pits and three spoil dump sites using excavated topsoil; (v) installing wastewater collection and treatment facilities at five toll stations, three parking lots and five service areas to reduce water pollution; (vi) installing 1,047 meters of sound abatement barriers at three sites; and (vii) equipping all coal-fired boilers with dust collection systems and using high-quality coal compliant with environmental requirements.

45. The environmental management cost estimated at appraisal was CNY310.91 million. According to the approved project environmental completion and acceptance review report, due to material and labor price fluctuation, the actual investment for environmental protection was CNY276.26 million, a reduction of 4.11%. These included slope stabilization, ecological rehabilitation, spoil sites re-vegetation, soil and water conservation measures, etc.

46. After the project opened, the travel distance from Wudalianchi to Yichun was shortened by around 400 km. The estimated fuel savings for the 20-year operating period was 200.06 million liters, while the estimated CO_2 emission reduction for the first 20 years was 589.23 thousand tons. In the first year of operation, CO_2 emissions are estimated to be reduced by 212,528 tons of carbon dioxide equivalent ($CO_{2e)}$. Emissions of SO_2 and NO_2 will also be reduced during operation.

47. During construction, all contractors fulfilled their obligations to protect the environment and implement mitigation in their construction schemes. Thus, the adverse effects of project construction in the surrounding environment were minimized. No rare natural resources were affected by the project. During operation, impacts on the ambient environment were minor and within the scope of the EIA. The environmental impact analysis is in Appendix 13.

IV. OVERALL ASSESSMENT AND RECOMMENDATIONS

A. Overall Assessment

48. The project is rated *successful*. It was (i) *relevant* to the development strategies of the government and ADB, (ii) *effective* in achieving outcomes, (iii) *efficient* in achieving the outcome and outputs, and (iv) *likely sustainable*. The project was successfully implemented and achieved its main objectives of promoting economic growth and reducing poverty in Heilongjiang province and the project area. Transport efficiency and safety in the project area improved as a result of the construction of the expressway and highway and road improvements. Implementation was effective and efficient. The quality of work on the project expressway and highway was satisfactory. During implementation and operation, sound technical solutions and environmental mitigation measures were widely applied in strict compliance with national and local regulations and guidelines. The completion of the missing link in north Heilongjiang benefited rural and poor areas, enabled rural transport services to reach remote and poor areas, and enhanced external investment and tourism development. Institutional capacity was strengthened through the implementation of human resource development plan. Knowledge gained during the project and capable staff resources were shared with other expressway projects. Substantial direct and indirect employment opportunities were created during implementation and - O&M of the expressway.

49. Although the expressway traffic volume is lower than the appraisal estimate, HPHB has sufficient financial capacity to operate and maintain the highways constructed under the project. Significant improvement in road conditions and transport capacity of the transport corridor will lead to economic development in cities and towns along the alignment, especially forestry farms, international trade, and scenic spots, and result in increased traffic volumes. The construction and opening of Amur Bridge in Heihe in 2019 will stimulate the border trade with the Russian Federation with an expected increase in the traffic volumes. The higher traffic volumes will increase toll revenues and further strengthen financial capacity of HPHB.

B. Lessons

50. The actual traffic volume at project completion was lower-than-expected. At appraisal, traffic growth projections should be based on a thorough OD survey of the road network in the project area and a realisitic projection of economic growth. The annual growth of traffic volume for the project expressway was projected at 17%, while the realistic rates ranges from 4% to 7%. A more advanced technique for forecasting average daily traffic should be adopted, realistic projection for socio-economic development in the project area is essential.

C. Recommendations

1. Project Related

51. RAMS has been in operation for 5 years since its establishment in 2011. The database is updated annually and used by HPHB to prepare annual road asset maintenance plans in combination with economic status and budget. The application of RAMS has achieved the expected outcome of facilitating decision making. HPHB should continue to use RAMS for cementing its impact and ensure wider application of the system.

52. Although fewer road accidents occurred on project roads during 2012–2015 after the road's completion, the government must continue its road safety efforts by taking all applicable engineering and management measures, as well as educating drivers and residents. HPTD and HPHB, in cooperation with the concerned government agencies, should maintain high road safety standards and performance on the roads, and be ready to deal with safety issues.

53. To cope with various technical difficulties and challenges in geotechnically and climatically complex terrain, 11 technical studies associated with construction of the project expressway were conducted. Significant social and economic benefits were thus generated for future road network development in Heilongjiang. These best practices should be shared widely.

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

55. A project performance evaluation report should be prepared in 2018 or later. By that time, the project and the Qian-nen corridor will be operating for more than 5 years, allowing for a more robust assessment of project traffic, road maintenance, physical road condition, benefits, and project impact on resettlement and poverty reduction.

2. General

56. The Design and Monitoring Framework was complete and comprehensive and guided the monitoring and evaluation of the project. The executing agency has demonstrated a strong implementation capacity to complete the project on time and with high quality. The economic benefits and regional economic integration along the corridor are gradually being realized. For a project that connects missing links in a region, more realistic traffic volume forecasts and toll revenue assumptions are necessary, as the economic and regional integration benefits that will be generated will only be fully realized over a longer period. In preparing similar project in the future, the PRC authorities should consider corridor connectivity and network capacity, make realistic traffic forecasts, and prioritize technical feasibility and financial viability of the relevant road section.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets and Indicators		Data Sources and Reporting Mechanisms
	At Appraisal (2008)	At Completion (2015)	
Impact			
More balanced economic development is realized in Heilongjiang province	Domestic trade of Heilongjiang increases from CNY244.6 billion in 2008 to CNY767.6 billion in 2020	Domestic trade of Heilongjiang increased to CNY764.02 billion in 2015	Heilongjiang, Jilin, and Inner Mongolia statistics yearbook
	Tourism revenues at Yichun increased from CNY1.5 billion in 2008 to CNY3.9 billion by 2018	Tourism revenues at Yichun increased to CNY6.14 billion in 2015	Heilongjiang statistics yearbook provincial and county statistics
	Tourism revenues at Wudalianchi increased from CNY106 million in 2007 to CNY302 million by 2018	Tourism revenues at Wudalianchi increased to CNY291 million in 2015	
	Average per capita rural incomes in the project area increase from CNY3,350 in 2008 to CNY6,400 by 2020	Average per capita rural incomes in the project area increased to CNY11,389 in 2015	County statistics
	The incidence of poverty in the project area falls from 8.6% in 2008 to 5% by 2020	The incidence of poverty in the project area had fallen to 3.29% in 2015	County statistics
Outcome			
A more resource-efficient, safe, and environment-friendly road transport system is developed in Heilongjiang province	Traffic on the new expressway will be AADT 6,000 pcu per day in 2014	Traffic on the new expressway is AADT 3,500 pcu per day in 2015	HPTD published traffic volume data
	Traffic on the class II road increased from AADT 3,927 pcu per day in 2014 to AADT 12,933 pcu per day in 2033	Traffic on the class II road is AADT 2,300 pcu per day in 2015	
	Travel time between Yichun and Nenjiang reduced by 6 hours by 2015	Travel time decreased by 6 hours when the expressway and highways opened to traffic in 2012	Travel time survey by HPTD
	Number of road accident fatalities per 10,000 vehicles in Heilongjiang reduced from 6.34 in 2007 to 4 in 2020	Number of road accident fatalities per 10,000 vehicles in Heilongjiang reduced to 5.56 in 2015	Accident statistics from Public Security Bureau
	Fuel savings of 6.0 billion liters and CO_2 emission reductions of 5.65 million tons due to reduced distance of 400 km from 2015 to 2034	Fuel savings of 200.06 million liters and CO_2 emission reductions of 0.589 million tons from 2015 to 2034	Re-estimated based on actual traffic volumes

	Average international roughness index of the provincial high-class road network between 3 and 4 by 2020	Achieved when the expressway and highway opened to traffic in 2012	HPHB annual report HPTD
	Bus route licensing and regulatory reform mainstreamed in Heilongjiang by 2020	Pilot programs were implemented in several counties in 2015	HPTD
Output 1 Provincial highway and associated facilities between Yichun and Nenjiang are operational	1.1 Travel distance between Yichun and Bei'an reduced by about 400 km by 2015	Achieved when the expressway was completed in 2012	HPTD
	1.2 A total of 206.26 km of expressway opened to traffic by 2015	Target achieved when the expressway was completed in 2012	HPTD
	1.3 A 12.88 km class I road between Nenjiang and the provincial border with Inner Mongolia constructed by 2014	Achieved when the road was completed in 2012	HPTD
	1.4 A total of 127.92 km of class II road between Longzhen and Nenjiang upgraded by 2014	Achieved when the road was completed in 2012	HPTD
	1.5 Three branch roads connecting the project road to Nenjiang City, Gequishan forest farm, and Qixingpao State Farm completed by 2014	Target achieved when the roads were completed in 2012	HPTD
Output 2 Road asset management system is operational in Heilongjiang	2.1 Maintenance planning and budgeting based on RAMS by 2011	Achieved after RAMS was introduced in 2011	HPHB progress reports and annual maintenance program
	2.2 Beginning 2011, annual budget for updating and maintaining road database allocated	Road database was established in 2011. It was updated and maintained since 2012.	HPHB progress reports
	2.3 Road maintenance works of $50 million selected by using RAMS implemented in 3 years (2011–2013)	Implementation achieved	HPHB progress reports
Output 3 Rural bus services are introduced in the project area	3.1 A total of 20 bus stations built or rehabilitated by 2014	Achieved in 2012	HPTD
	3.2 Bus route licensing reform implemented in the three pilot villages by 2014	Reform completed in 2011	HPTD progress reports

	3.3 Formal bus services extended from 42 to 45 administrative villages in Bei'an City by 2014	45 administrative villages in Bei'an City had formal bus services in 2015	HPTD
Output 4 Institutional and staff capacity are strengthened	4.1 Capacity of 30 staff for enforcing of road safety law and regulation improved by 2013	30 traffic police received training	HPTD
	4.2 Capacity of 165 staff for managing public transport and road maintenance improved by 2014	180 staff received training	HPHB progress reports
	4.3 Regulatory framework for rural village bus services adopted by 2013	Framework established and adopted since 2012. Bus service to rural villages has improved.	HPTD progress reports
	4.4 Proposal for realigning HPHB functions are evaluated by HPTD in 2014	Exposure draft was published by MOT in 2015, general reform of MOT limits the realignment	HPTD progress reports

AADT = average annual daily traffic, CO_2 = carbon dioxide, EMP = environmental management plan, HPHB = Heilongjiang Provincial Highway Bureau, HPTD = Heilongjiang Provincial Transportation Department, PCU = passenger car unit, RAMS = road asset management system, SDAP = social development action plan, MOT = Ministry of Transport.

Source: Asian Development Bank.

CHRONOLOGY OF MAJOR EVENTS IN THE PROJECT'S HISTORY

28 April 2006	Approval of project preparatory technical assistance
22–30 January 2007	Fact-Finding Mission fielded
4 September 2008	Board circulation
24 November 2009	Management Review Meeting held
9–11 December 2009	Appraisal Mission fielded
25 February 2010	First civil works contracts approved
5 March 2010	Start of civil works
16–17 March 2010	Loan negotiations held
20 April 2010	Loan approval
02 July 2010	Loan Agreement signing
09 August 2010	First contract for consulting services approved
05 November 2010	Loan effectiveness
15 November 2010	First disbursement
15–18 November 2010	Inception Mission
23–27 May 2011	First Loan Review Mission
10–14 October 2011	Second Loan Review Mission and hand-over
9 January 2012	Transfer of the project administration to Asian Development Bank's Resident Mission in the People's Republic of China
18–25 June 2012	Third Loan Review Mission
14 December 2012	First loan reallocation approved
22–28 April 2013	Midterm Review Mission
15–19 December 2014	Fourth Loan Review Mission
14-16 December 2015	Fifth Loan Review Mission
15 May 2015	First repayment of loan principal
30 June 2015	Original loan closing date
14 September 2015	Final disbursement
13 January 2016	Actual loan closing date
14–18 November 2016	Project Completion Review Mission

PROJECT COSTS AND FINANCING PLAN

Table 3.1: Appraised and Actual Project Costs
($ million)

Component	Appraisal Estimate	Actual
A. Investment Costs		
1. Road civil works		
a. Road sections		
i. Expressway	468.87	571.26
ii. Class I road	41.15	47.25
iii. Class II road	78.91	99.11
b. Others	94.40	118.08
2. Road maintenance works	50.00	7.29
3. Bus station works	0.88	0.87
4. Consulting services	16.02	1.48
5. Equipment and installation	26.17	18.64
6. Resettlement	45.32	42.45
7. Project management	40.23	53.12
Total Base Cost	**861.95**	**959.55**
B. Contingencies		
1. Physical	44.42	0.00
2. Price	19.28	0.00
Subtotal (B)	**63.70**	**0.00**
C. Financing Charges during Construction		
1. Interest	72.09	22.59
2. Commitment charges	0.41	0.40
Subtotal (C)	**72.50**	**22.99**
Total Project Cost (A+B+C)	**998.15**	**982.54**

Sources: Asian Development Bank and Heilongjiang Provincial Transport Department.

Table A3.2: Financing Plan
($ million)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	359.38	340.90
ADB Financed	183.00	196.69
Other External Financing	383.27	421.96
Total	**925.65**	**959.55**
IDC Costs		
Borrower Financed	19.07	19.99
ADB Financed	17.00	3.00
Other External Financing	36.43	0.00
Total	**72.50**	**22.99**

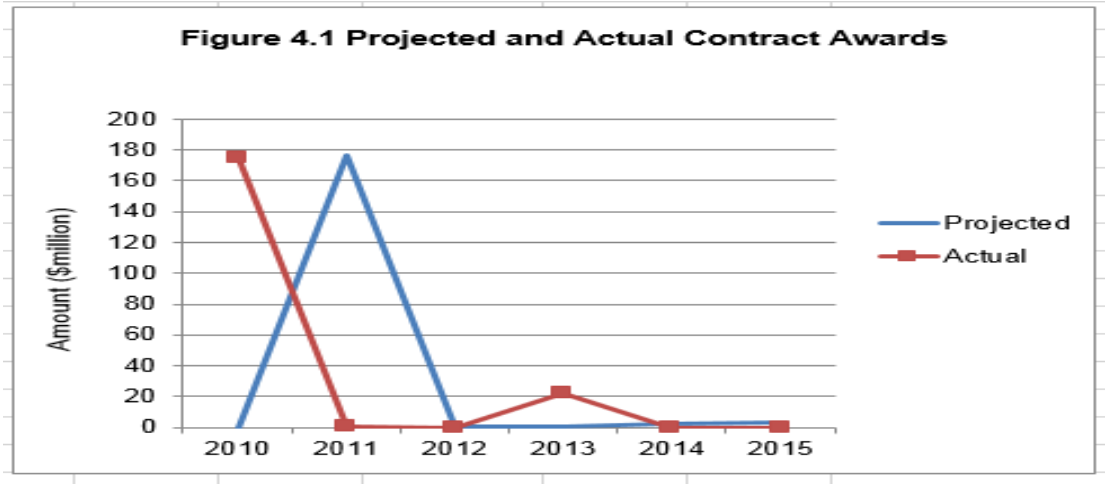
ADB = Asian Development Bank; IDC = Interests during construction
Sources: Asian Development Bank and Heilongjiang Provincial Transport Department.

PROJECTED AND ACTUAL CONTRACT AWARDS AND DISBURSEMENTS

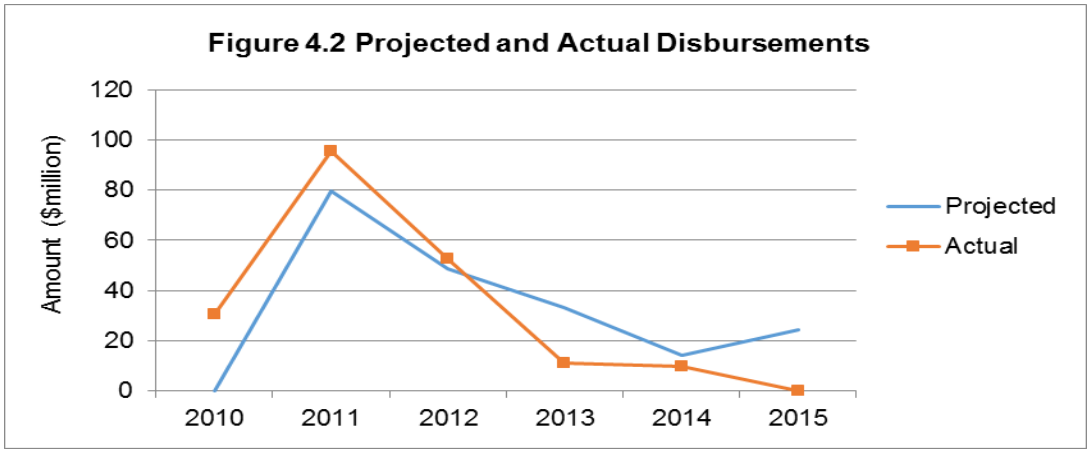
Table A4.1: Projected and Actual Contract Awards and Disbursements
($million)

	Contract Awards		Disbursements	
Year	**Projected**	**Actual**	**Projected**	**Actual**
2010	0.0	174.7	0.0	30.6
2011	176.5	0.7	79.5	95.7
2012	0.7	0.0	48.8	52.7
2013	0.2	22.0	33.3	11.0
2014	2.7	0.0	14.1	9.6
2015	3.0	0.0	24.3	0.1
Total	**183.0**	**197.4**	**200.0**	**199.7**

Source: Asian Development Bank's Loan Financial Information System.



Source: Asian Development Bank's Loan Financial Information System.



Source: Asian Development Bank's Loan Financial Information System.

APPRAISAL AND ACTUAL IMPLEMENTATION SCHEDULES

Activity	2009				2010				2011				2012				2013				2014				2015	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
A. Project Processing																										
1. Retroactive financing approval				▲																						
2. Loan approval						▲																				
3. Loan effectiveness							▲																			
B. Land Acquisition and Resettlement																										
1. ADB approval of resettlement plans				▲																						
2. Land use plan approval				▲																						
3. Transfer land and relocate housing																										
4. Livelihood rehabilitation																										
C. Component A: Improving Road Infrastructure																										
1. Civil works financed by ADB																										
a. For retroactive financing contract packages																										
(i) bidding and contract award																										
(ii) mobilization and construction																										
b. For other contract packages																										
(i) bidding and contract award																										
(ii) mobilization and construction																										
2. Civil works financed by the government																										
a. Traffic monitoring station																										
b. Landscaping																										
c. Ancillary buildings																										
D. Component B: Improving Road Maintenance																										
1. Install RAMS and produce maintenance plans																										
2. Bidding for maintenance works																										
3. Road maintenance																										
E. Component C: Improving Rural Village Bus Services																										
1. Construction and rehabilitation of bus stations																										
2. Implementation of pilot reforms																										
F. Component D: Strengthening Institutional Capacity																										
G. Equipment Procurement and Installation																										
1. ITS and traffic control equipment																										
a. Bidding																										
b. Delivery and installation																										
2. Road safety equipment																										
a. Bidding																										

Activity	2009				2010				2011				2012				2013				2014				2015	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
b. Delivery and installation																										
3. Road maintenance equipment																										
a. Bidding and contract award																										
b. Delivery																										
H. Consulting Services																										
1. ADB-financed consulting services																										
a. Preparation and issuance of RFP																										
b. Bidding and contract award																										
c. Mobilization and service																										
2. Government-financed consulting services																										
a. Mobilization and service																										

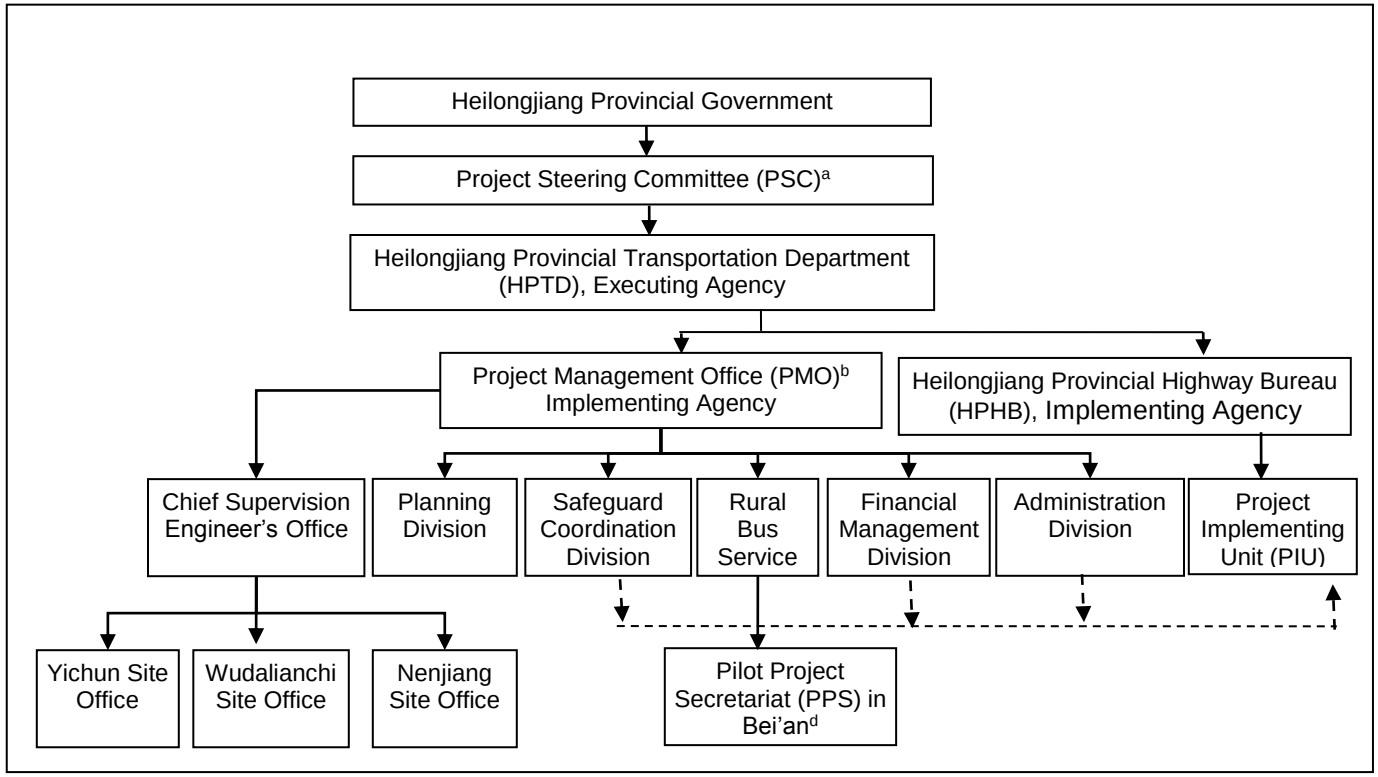
ADB=Asian Development Bank, ITS=intelligent transport system, RAMS=road asset management system, RFP=request for proposal

Appraisal Actual Resettlement for bus station Actual resettlement for bus station ▲ Monitoring and evaluation

Sources: Asian Development Bank and Heilongjiang Provincial Transport Department.

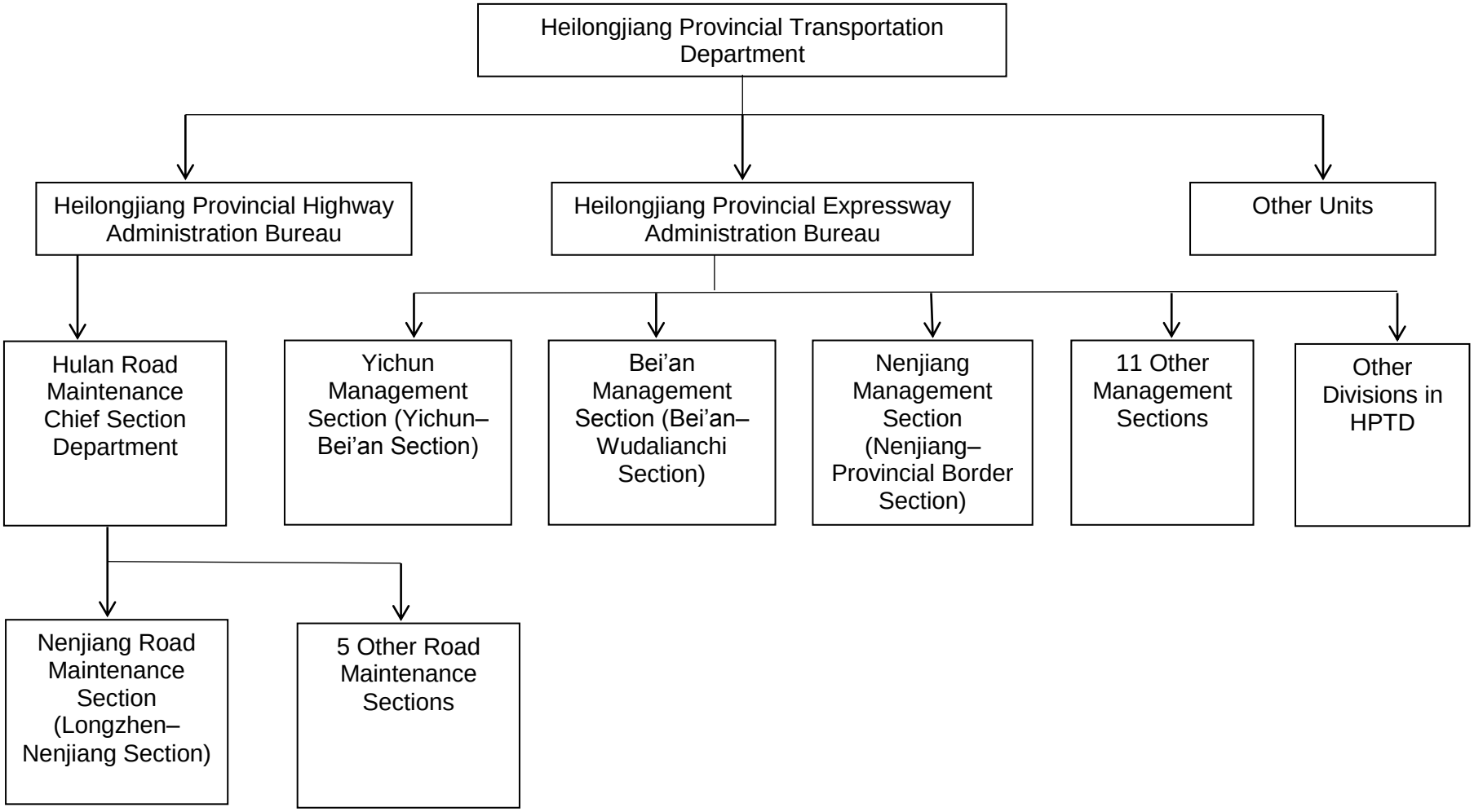
ORGANIZATIONAL CHARTS

Figure A6.1: Organizational Chart during Construction



[a] PSC chairman: Deputy Governor of Heilongjiang Province; vice chairman: Director General, HPTD.
[b] PMO implemented project component A, C, and D.
[c] HPHB implemented project component B.
[d] PPS was responsible for day-to-day implementation of the pilot bus route licensing reform.
Source: Heilongjiang Provincial Transport Department.

Figure A6.2: Organizational Chart during Operation



Source: Heilongjiang Provincial Transport Department.

STATUS OF COMPLIANCE WITH LOAN COVENANTS

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
Project Implementation		
1. HPTD and the IAs shall carry out the Project in accordance with plans, design standards, specifications, work schedules, and construction methods acceptable to ADB. HPTD shall furnish, or cause to be furnished, to ADB, promptly after their preparation, such plans, design standards, specifications and work schedules, and any material modifications subsequently made therein, in such detail as ADB shall reasonably request.	PA, Section 2.04	Complied with. ADB policies are complied with and documented well.
2. HPTD and the IAs shall promptly inform ADB of any condition which interferes with, or threatens to interfere with, the progress of the Project, the performance of its obligations under this Project Agreement or the accomplishment of the purposes of the Loan.	PA, Section 2.07 (b)	Complied with.
3. HPTD and the IAs shall furnish to ADB quarterly reports on the execution of the Project and on the operation and management of the Project facilities. Such reports shall be submitted in such form and in such detail and within such a period as ADB shall reasonably request, and shall indicate, among other things, progress made and problems encountered during the quarter under review, steps taken or proposed to be taken to remedy these problems, and proposed program of activities and expected progress during the following quarter.	PA, Section 2.08 (b)	Complied with. Quarterly reports were submitted on time.
4. Promptly after physical completion of the Project, but in any event not later than 3 months thereafter or such later date as ADB may agree for this purpose, HPTD shall prepare and furnish to ADB a project completion report, in such form and in such detail as ADB shall reasonably request, on the execution and initial operation of the Project, including its cost, the performance by HPTD and the IAs of their obligations under this Project Agreement and the accomplishment of the purposes of the Loan.	PA, Section 2.08(c)	Complied with. Project completion report was submitted to ADB.

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
5. HPTD and the IAs shall enable ADB's representatives to inspect the Project, the works financed out of the proceeds of the Loan, and any relevant records and documents.	PA, Section 2.10	Complied with. Inspections done during review missions.
6. HPTD and the IAs shall at all times operate and maintain their road assets, equipment and other property, and from time to time, promptly as needed, make all necessary repairs and renewals thereof, all in accordance with sound administrative, financial, engineering, environmental, construction, maintenance and operational practices.	PA, Section 2.11 (c)	Complied with. The road assets are well operated and maintained.
7. HPTD shall be the Project Executing Agency responsible for overall implementation of the Project. A project steering committee chaired by the Vice Governor of HPG shall provide guidance and resolve project implementation issues. The PMO established within HPTD shall be headed by a project manager and shall be responsible for overall project implementation, which shall include, among others, (i) coordinating and overseeing project implementation; (ii) coordinating activities to comply with safeguard requirements; (iii) supervising procurement, (iv) monitoring utilization of the Loan and Borrower's funds; (v) preparing and submitting reports to ADB and the Government, (vi) ensuring that the complaints received from local people are addressed adequately; (vii) submitting progress, audit and other reports to ADB; and (viii) coordinating with ADB review missions. HPTD, through the PMO, shall be responsible for direct implementation of Components A (roads construction), C (rural bus services) and D (capacity building) of the Project.	LA, Schedule 5, para 1; PA, Schedule, para. 1	Complied with. HPTD and PMO performed their role as indicated in the agreements with ADB.
8. The PMO shall form a pilot project secretariat within the Bei'an City transport bureau which will be responsible for day-to-day implementation of the rural village bus services pilot project portion of Component C of the Project. The pilot project secretariat shall be chaired by the pilot project	LA, Schedule 5, para 2; PA, Schedule, para. 2	Complied with. The pilot project secretariat was formed on 10 June 2011 and fulfilled its responsibilities.

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
coordinator who shall (i) provide the interface between the PMO and the pilot project, (ii) oversee day-to-day implementation, (iii) provide information to the PMO for decision making, (iv) supervise the activities of consultants to be engaged under the Project, and (v) submit progress reports to the PMO.		
9. HPTD, through HPHB, shall be responsible for direct implementation of Component B (road maintenance). HPHB shall establish a Project Implementation Unit to be responsible for implementing the activities for improving road maintenance.	LA, Schedule 5, para. 3; PA, Schedule, para. 3	Complied with. HPTD and HPHB discharged their duties fully.
10. ADB and HPG shall conduct annual Project reviews, and a detailed midterm review of the Project in the third year of the project implementation covering all institutional, administrative, organizational, technical, environmental, social, poverty reduction, resettlement, economic, financial, and other relevant aspects that may have an impact on the performance of the Project and its viability. The review shall examine compliance with covenants in this Loan Agreement and the Project Agreement. ADB and HPG shall identify major problems and agree on any changes needed to achieve the project objectives.	LA, Schedule 5, para. 5; PA, Schedule, para. 15	Complied with, 4 loan review missions and 1 midterm mission were conducted.
11. Change in Ownership. In the event that (i) any change in ownership or operation of the Project facilities or Project expressway or (ii) any sale, transfer, or assignment of HPG's and HPTD's shares or interest in the Project expressway is contemplated, the Borrower shall consult with ADB at least 6 months prior to the implementation of such a change. The Borrower shall ensure that such change is carried out in a lawful and transparent manner.	LA, Schedule 5, para 4; PA, Schedule, para. 5	No change occurred in ownership.
12. Road Maintenance. HPTD shall implement the road maintenance component by (i) purchasing RAMS and specialized data collection vehicles; (ii) collecting field data annually, and updating and maintaining the	PA, Schedule, para. 6	Complied with. The component was successfully implemented with good impact on road

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
road database and/or datacenter; and (iii) financing maintenance works at an estimated cost of $50,000,000 including $5,000,000 for pilot testing of performance-based maintenance contract works over 3 years to be selected from priority works identified in the annual road maintenance plans.		maintenance.
13. Road Safety. HPG shall ensure that (i) HPTD incorporates the road safety auditor's recommendations into the road detailed design and implements them during construction; and (ii) HPSB installs (a) traffic violation monitoring cameras on the Project expressway and at the entrances to villages where the Project class II road passes, and (b) two weighbridges on the Project class II road, within 6 months after its opening.	PA, Schedule, para. 9	Complied with. Recommendations were implemented and ITS equipment was installed.
14. Rural Village Bus Services. HPG shall (i) cause HPTD to ensure that (a) bus services which are introduced through the Project are operating in three administrative villages of Bei'an City, (b) documents governing the provision of village bus service are developed and used, and (c) private bus service providers are given equal opportunity to be involved in the pilot project; (ii) cause HPSB to ensure that the Traffic Police Stations in the three administrative villages enforce all traffic regulations in the pilot project area; and (iii) cause HPFB to provide subsidy, if needed, to the selected bus services providers.	PA, Schedule, para. 10	Complied with. The rural village bus had expanded services by project completion.
15. Private Sector Participation. HPTD shall, at least 6 months prior to project completion, explore the possibility of (i) entering into an O&M concession for the Project expressway, and (ii) engaging the private sector in providing village bus services and road maintenance works, and shall report on its findings in the project completion report.	PA, Schedule, para. 12	No major achievement was made on the O&M concession because of the central government's restraint.
16. Project Performance Monitoring and Evaluation. HPTD shall (i) monitor and evaluate project impact through a project performance monitoring system including	PA, Schedule, para. 14	Complied with. Five PPME reports were received in a timely manner.

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
data disaggregated by gender, wherever possible; (ii) collect the necessary information and data on project performance at project inception, prior to mid-term review, at project completion, and annually for 3 years after project completion; and (iii) submit to ADB the reports summarizing the key findings of monitoring.		
Project Safeguards		
17. Environment. HPTD shall ensure that (i) the Project is designed, constructed, operated and maintained in accordance with national and local laws and regulations, ADB's *Environment Policy* (2002), the EIA and SEIA; (ii) any adverse environmental impacts arising from the Project are minimized by implementing the mitigation measures and EMP presented in the EIA; (iii) the EMP is updated at the engineering design stage and incorporated into the bidding documents and civil works contracts; (iv) all environmental permits, licenses, and clearances are obtained in a timely manner; and (v) the status of implementation of the EMP and any violations of environmental standards are reported to ADB on a semiannual basis in accordance with the specifications set forth in the EIA.	PA, Schedule, para 16	Complied with. ADB's Environment Policy was complied with; measures were conducted to mitigate the environmental impact caused by project activities.
18. Resettlement. HPTD shall ensure, and cause the PMO to ensure, that (i) the RPs are implemented, (ii) all land and rights-of-way required by the Project are made available in a timely manner, (iii) the compensation and entitlements for APs are implemented in accordance with all the Borrower's applicable laws and regulations and ADB's *Involuntary Resettlement Policy* (1995), (iv) compensation and resettlement assistance is given to the APs prior to dispossession and displacement, (v) the timely provision of counterpart funds is made for land acquisition and resettlement activities, (vi) any financial obligations in excess of the budget estimates of the two RPs are met, and (vii) the APs are at least as well off as they would have been in the absence of the Project.	PA, Schedule, para. 17	Complied with. ADB policies were complied with. Resettlement issues were managed well.

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
19. HPTD shall ensure that (i) the PMO updates the RPs as necessary to reflect any material changes in the project scope or other changes, and submits any such changes to ADB for its concurrence; (ii) bidding documents for Works include requirements necessary to comply with the RPs and entitlements for permanent and temporary impacts to APs; (iii) adequate staff and resources are committed to supervising and internally monitoring the implementation of the RPs; (iv) quarterly reports are submitted to ADB during resettlement implementation, and a resettlement completion report is submitted upon completion of implementation; and (v) an independent institute is contracted to carry out monitoring and evaluation, and submit evaluation reports to ADB and HPTD on a semi-annual basis the first year, and annually for 2 years thereafter.	PA, Schedule, para. 18	Complied with. The external resettlement monitoring reports were submitted to ADB, generally on time.
20. Social and Gender Development. HPTD shall ensure that (i) the SDAP is implemented in accordance with its proposed actions; (ii) adequate staff and resources are provided for supervising and monitoring the implementation of the SDAP and the results are reported annually to ADB; (iii) the bidding documents for Works contracts include requirements to comply with the SDAP and as a priority to provide employment to women, ethnic minorities, and the poor; and (iv) women, ethnic minorities, and the poor living in the project area are encouraged to participate in planning and implementing the Project.	PA, Schedule, para 19	Complied with. SDAP is well implemented, the project has benefited vulnerable groups.
Financial		
21. The Borrower shall make available to HPG promptly as needed the funds, facilities, services, land and other resources which are required, in addition to the proceeds of the Loan, for carrying out the Project.	LA, Section 4.02	Complied with. Sufficient domestic funds were provided on time.
22. HPTD and the IAs shall maintain, or cause to be maintained, records and accounts	PA, Section 2.06	Complied with. All audited financial

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
adequate to identify the Works and Consulting Services and other items of expenditure financed out of the proceeds of the Loan, to disclose the use thereof in the Project, to record the progress of the Project (including the cost thereof) and to reflect, in accordance with consistently maintained sound accounting principles, its operations and financial condition.		statements of the project were submitted on time each year.
23. Counterpart Support. HPG shall ensure that all counterpart financing necessary for the Project is provided in time, and that HPG, through HPTD, makes available all funds and resources necessary for construction, operation and maintenance, and management of the Project on a timely basis.	PA, Schedule, para. 4	Complied with. All counterpart funds were provided on time.
24. HPTD and the IAs shall furnish to ADB all such reports and information as ADB shall reasonably request concerning (i) the Loan and the expenditure of the proceeds thereof; (ii) the Works and Consulting Services and other items of expenditure financed out of such proceeds; (iii) the Project; (iv) the administration, operations and financial condition of HPTD; and (v) any other matters relating to the purposes of the Loan.	PA, Section 2.08 (a)	Complied with.
25. Financial Management. HPTD shall ensure that it (i) maintains a debt service coverage ratio of 1.00 in the first 2 years of operation and 1.20 thereafter; (ii) provides sufficient funding for operation and maintenance of the Project expressway and Project class I road to balance any shortfall in cash flow in the initial years of operation; (iii) seeks ADB's concurrence on the proposed toll structure and rates 6 months before the Project expressway opens and before seeking HPG approval; and (iv) maintains a sound financial management system which includes (a) maintenance of separate accounts and records for the project, (b) financial planning and budgetary control, (c) data processing, and (d) procedure for financial reporting.	PA, Schedule, para. 11	Not due yet. The debt service coverage ratio of the first 2 years has been reached, with sufficient funding provided; a sound financial management system has been maintained.

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
26. HPTD and the IAs shall (i) maintain separate accounts for the Project; (ii) have such accounts and related financial statements (balance sheet, statement of income and expenses, and related statements) audited annually, in accordance with appropriate auditing standards consistently applied, by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB; and (iii) furnish to ADB, promptly after their preparation but in any event not later than 6 months after the close of the fiscal year to which they relate, certified copies of such audited accounts and financial statements and the report of the auditors relating thereto (including the auditors' opinion on the use of the Loan proceeds and compliance with the financial covenants of the Loan and Project Agreements as well as on the use of the procedures for statement of expenditures), all in the English language. HPTD and the IAs shall furnish to ADB such further information concerning such accounts and financial statements and the audit thereof as ADB shall from time to time reasonably request. PA, Section 2.09 (a)	PA, Section 2.09 (a)	Complied with. Separate accounts have been maintained and managed well.
Governance and Anticorruption Measures		
27. Anticorruption and Internal Control. HPG shall, and shall cause HPTD to, comply with ADB's *Anticorruption Policy* (1998, as amended to date). HPG acknowledges that consistent with its commitment to good governance, accountability and transparency, ADB reserves the right to investigate any alleged corrupt, fraudulent, collusive or coercive practices relating to the Project; and shall cooperate fully with any such investigation and extend all necessary assistance, including providing access to all relevant books and records, as may be necessary for the satisfactory completion of any such investigation.	PA, Schedule, para. 20	Complied with.
28. Grievance Mechanism. HPTD shall ensure that complaint and problem management mechanisms and procedures are established	PA, Schedule, para. 22	Complied with. Complaints were managed well under

Covenant/Reference	Reference in Loan Agreement	Status of Compliance
and functioning effectively to (i) review and document complaints of project stakeholders; (ii) proactively address grievances; (iii) provide the stakeholders with notice of the chosen mechanism, action, and/or decision; and (iv) prepare periodic reports to summarize the final outcomes and make these available to ADB upon request.		the grievance mechanism set up by the project.
Other Matters		
29. Labor Standards. HPTD shall ensure that the construction contractors (i) provide timely payment of wages and safe working conditions to all workers; (ii) provide women's employment, where appropriate, and pay equal wages to women and male employees for work of equivalent value; and (iii) do not employ child labor as required by the relevant laws and regulations of the Borrower; and shall ensure that compliance with the above is monitored by the PMO. HPTD shall ensure that the project contractors maximize the employment of local poor people who meet the job and efficiency requirements for construction and maintenance of the project works. Such workers shall be provided with adequate on-the-job training.	PA, Schedule, para. 23	Complied with. Local people have benefited from the project.
30. Health. HPTD shall ensure that the PMO, in coordination with the local health bureaus, causes (i) the contractors to disseminate information on the risks of socially and sexually transmitted diseases, including HIV/AIDS, to their employees, temporary laborers and family members, and subcontractors during project implementation; and (ii) implementation of these requirements to be monitored and reported annually to ADB as part of the SDAP.	PA, Schedule, para. 24	Complied with. No health issue occurred during project implementation. Relevant training/materials are delivered.

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DETAILS OF CIVIL WORKS PACKAGES

No.	Contractor	Mode of Procurement	Contract Date	Country	Contract Amount (CNY)	Contract Amount ($ equivalent)
A1	Long Jian Road and Bridge Co., Ltd.	ICB	11 September 2010	PRC	439,660,036	64,103,467
A2	Chengdu Huachuan Highway Construction (Group) Co., Ltd.	ICB	17 September 2010	PRC	270,819,958	39,486,186
A3	China Railway 13th Bureau Group Co., Ltd.	ICB	19 September 2010	PRC	256,070,416	37,335,669
A4	China Railway 13th Bureau Group Co., Ltd.	ICB	19 September 2010	PRC	397,460,770	57,950,714
A5	Long Jian Road and Bridge Co., Ltd.	ICB	11 September 2010	PRC	381,770,198	55,662,992
A6	Long Jian Road and Bridge Co., Ltd.	ICB	11 September 2010	PRC	450,838,633	65,733,332
A7	Daqing Construction Installation Group Co., Ltd.	ICB	26 September 2010	PRC	291,919,083	42,562,488
A8	Long Jian Road and Bridge Co., Ltd.	ICB	17 September 2010	PRC	277,686,694	40,487,373
A9	Shanxi Provincial Mechanical Construction Co., Ltd.	ICB	18 October 2010	PRC	114,913,651	16,754,680
A10	The Second Engineering Co., Ltd. Of China Railway No. 3 Engineering Group Co., Ltd.	ICB	10 October 2010	PRC	109,131,630	15,911,648
A11	Long Jian Road and Bridge Co., Ltd.	ICB	10 October 2010	PRC	174,284,125	25,411,035
A12	Jiangxi Province Highway & Bridge Engineering Bureau	ICB	07 October 2010	PRC	161,972,812	23,616,017
A13	China Railway Shisiju Group Corporation	ICB	30 September 2010	PRC	144,713,160	21,099,519
A15	Long Jian Road and Bridge Co., Ltd.	ICB	26 March 2010	PRC	149,580,720	21,809,221
A16	China Railway 13th Bureau Group Co., Ltd.	ICB	25 March 2010	PRC	153,697,139	22,409,404
A17	China Railway 13th Bureau Group Co., Ltd.	ICB	25 March 2010	PRC	179,830,029	26,219,641
A18	Long Jian Road and Bridge Co., Ltd.	ICB	19 March 2010	PRC	140,702,752	20,514,792
B1	CCCC Fourth Highway Engineering Co., Ltd.	ICB	22 August 2010	PRC	94,215,135	13,736,788
B2	China Railway 13th Bureau Group 4th Engineering Co., Ltd.	ICB	17 August 2010	PRC	153,353,876	22,359,356
B3	Long Jian Road and Bridge Co., Ltd.	ICB	26 September 2010	PRC	110,880,427	16,166,627
B4	Long Jian Road and Bridge Co., Ltd.	ICB	26 September 2010	PRC	108,003,878	15,747,219
B5	Long Jian Road and Bridge Co., Ltd.	ICB	11 September 2010	PRC	135,081,469	19,695,196
B8	Long Jian Road and Bridge Co., Ltd.	ICB	26 March 2010	PRC	332,862,245	48,532,098
	Total				**5,029,448,836**	**733,305,462**

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

Source: Heilongjiang Provincial Transportation Department.

ECONOMIC REEVALUATION

A. General

1. The project expressway comprises four road sections: Yichun–Bei'an, Bei'an–Wudalianchi, Longzhen–Nenjiang, and Nenjiang–Inner Mongolia border. The reevaluation was undertaken using with- and without-project scenarios in accordance with the *Guidelines for the Economic Analysis of Projects (1997)* of the Asian Development Bank (ADB). The project increased the corridor's transport capacity, allowing vehicles on the project expressway to drive at faster speeds, for shorter distances, and with lower operation costs. With better transport conditions and lower operation costs, traffic has increased. The reevaluation period covered the implementation period from 2010 to 2014 and the operation period from 2012 to 2033. The analysis has been undertaken using 2016 constant prices expressed in Chinese yuan (CNY) using the domestic price numeraire with a shadow exchange rate factor of 1.01 for foreign exchange effects. Taxes and duties and financing charges were excluded and a shadow wage rate of 0.67 on unskilled labor was applied, which is consistent with the factors adopted at appraisal. The economic opportunity cost of capital (EOCC) is 9%.

B. Revised Traffic Forecast

2. The project is located in the northwest of Heilongjiang province. It improves the transport capacity of the province's East–West 2 corridor (Qianfeng Farm–Nenjiang) by completing a key missing section between Yichun and Wudalianchi, improving the capacity of the existing road section between Longzhen and Nenjiang, and connecting these improved road sections to the other parts of the road network. This completes the Yichun–Wudalianchi–Harbin tourism loop connecting prominent tourism destinations for forest tourism and geological scenery, and the provincial capital city. Before the project, there was no direct road connection - between Yichun and Wudalianchi, except for some local gravel roads used by the timber industry for transporting timber products. After the completion of the project road sections, the traffic between these cities benefited from a direct high-quality road link, shortening the distance between Yichun and Nenjiang by 400 kilometers (km) and reducing travel time by 6 hours.

3. The Bei'an–Wudalianchi expressway opened to traffic at the end of 2011 and the other sections completed at the end of 2012. In 2013, initial traffic measured as passenger car units (pcu) was 4,477 for the Yichun–Bei'an section (expressway), 4,726 for Bei'an–Wudalianchi (expressway), 4,686 for Longzhen–Nenjiang (class II highway), and 3,734 for Nenjiang to the provincial border with the Inner Mongolia Autonomous Region (class I road). The traffic grew at an annual rate of 17%. Traffic count results in 2016 are provided in Table A9.1. The traffic forecast was made based on the actual traffic data from 2013 to 2016, also considering the composition of -future traffic flow, the impact of connecting roads and latest local socioeconomic development status, and -overall future transport demand of the corridor. The growth rates are estimated to be 7% in 2016–2020, 6% in 2021–2025, and 4% beyond 2025. Table A9.2 compares the traffic forecast in four sections at appraisal with the updated forecast.

Table A9.1: Traffic Count in 2016
(PCU–AADT)

Road Section	Small Truck	Medium Truck	Large Truck	Extra-large Truck	Passenger Car	Bus	Total
Yichun–Bei'an	692	219	206	1,435	4,176	68	6,796
Bei'an–Wudalianchi	377	220	225	2,398	2,948	113	6,281
Longzhen–Nenjiang	487	176	204	1,960	4,146	136	7,110
Nenjiang–Border	693	116	97	1,791	2,713	122	5,532
Total	**562**	**183**	**183**	**1,896**	**3,496**	**110**	**6,430**

AADT = average annual daily traffic, PCU = passenger car unit.
Source: Heilongjiang project management office under Heilongjiang Provincial Transportation Department.

Table A9.2: Updated Traffic Forecast Results by Section
(PCU–AADT)

	2015		2020		2030	
	Appraisal Estimates	Updated Forecast	Appraisal Estimates	Updated Forecast	Appraisal Estimates	Updated Forecast
Yichun–Bei'an	9,603	5,866	14,364	11,213	25,676	19,014
Bei'an–Wadalianchi	10,665	6,190	14,619	12,040	24,225	20,239
Longzhen–Nenjiang	4,523	6,138	6,631	11,592	11,410	19,526
Nenjiang–Border	5,105	4,897	8,226	9,652	16,722	16,628

AADT = average annual daily traffic, PCU = passenger car unit.
Sources: Asian Development Bank and Heilongjiang project management office under Heilongjiang Provincial Transportation Department.

C. Benefits

4. The economic benefits quantified at appraisal included (i) vehicle operating costs (VOCs) savings resulting from the reduced travel distance and improved road conditions, (ii) savings in value of passengers' time and of freight tied up in transit, (iii) savings resulting from fewer accidents, and (iv) benefits to generated traffic. These benefits were reevaluated with updated information.

5. VOC savings are the major economic benefits. VOC data for vehicle types under different road and traffic conditions were used in the calculation. VOCs were calculated based on fuel and lubricating oil consumption, tires and spare parts, vehicle maintenance labor costs, vehicle crew wages, vehicle depreciation, and average travel speed as a function of road conditions. VOC savings from reduced travel distance were calculated. For generated traffic, half of VOC savings were considered as the benefits.

6. Passenger travel time savings are estimated for different passenger vehicles types. The average passenger time value is derived from the per-capita gross domestic product (GDP) of Heilongjiang province in 2015 and assumed an increase of 5% to 2% for the period of 2013–2033. Other factors considered in recalculating travel time savings included average vehicle load, percentage of work-related trips, travel distance under with- and without-project scenarios.

D. Economic Internal Rate of Return

7. As the four sections of the project comprised an integrated road network in the region, the economic reevaluation calculated EIRR of the whole project rather than separately for each road section. The reevaluated EIRR for the whole project was 12.8%, which was lower compared with the 17.79% EIRR appraisal estimate. The lower EIRR was mainly a result of the lower traffic forecast than appraisal estimates, offset by the higher unit rates of VOC savings and time savings. The reevaluated EIRR was higher than the EOCC of 9%, and the project is considered economically viable. The results of the economic reevaluation are in Table A9.3.

8. A sensitivity analysis was carried out to test the impacts of (i) an increase in operation and maintenance costs, (ii) a decrease in benefits, and (iii) a combination of these two scenarios. The results of the sensitivity analysis are presented in Table A9.4.

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

	Costs			Benefits				
Year				VOC Savings	Time Savings	Accident Savings		Net Benefits
2010	1,972.2	-	-	1,972.2	-	-	-	-
2011	2,629.6	-	-	2,629.6	-	-	-	-
2012	1,972.2	-	-	1,972.2	-	-	-	-
2013	-	30.0	12.3	42.3	-	-	-	-
2014	-	30.9	12.6	43.5	1,516.2	37.8	142.9	1,696.9
2015	-	31.8	13.0	44.8	414.6	43.7	159.4	617.7
2016	-	32.8	13.4	46.2	453.4	50.5	178.0	682.0
2017	-	33.8	13.8	47.6	495.9	58.3	199.2	753.5
2018	-	34.8	14.2	49.0	542.4	67.4	223.2	833.0
2019	-	35.8	14.6	50.5	593.3	77.9	250.5	921.6
2020	-	36.9	15.1	52.0	648.9	90.0	281.4	1,020.2
2021	-	38.0	15.5	53.5	709.7	104.1	308.4	1,122.2
2022	986.1	0.0	0.0	986.1	770.3	120.7	332.2	1,223.1
2023	-	40.3	16.5	56.8	836.1	139.9	357.3	1,333.3
2024	-	41.5	17.0	58.5	907.5	162.2	383.8	1,453.5
2025	-	42.8	17.5	60.3	985.0	188.1	411.8	1,584.9
2026	-	44.1	18.0	62.1	1,544.4	216.3	441.4	2,202.1
2027	-	45.4	18.6	63.9	1,636.3	242.2	463.2	2,341.8
2028	-	46.7	19.1	65.9	1,733.8	271.2	485.7	2,490.8
2029	-	48.1	19.7	67.8	1,837.1	303.7	509.0	2,649.8
2030	-	49.6	20.3	69.9	1,946.5	340.2	533.0	2,819.6
2031	-	51.1	20.9	72.0	2,531.0	384.5	557.6	3,473.1
2032	986.1	52.6	21.5	1,060.2	2,707.9	432.8	587.1	3,727.8
2033	(3,287.0)	52.6	21.5	(3,212.9)	2,898.1	482.7	617.5	3,998.3
							Economic Internal Rate of Return =	**12.8%**

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

Source: Heilongjiang project management office under Heilongjiang Provincial Transportation Department.

Table A9.4: Sensitivity Analysis

	Change in		
	O&M Cost	**Benefits**	**EIRR**
Base Case			12.8%
Change (+/-)	+20%		12.7%
		-10%	11.7%
		-20%	10.7%
	+20%	-20%	10.6%

Source: Heilongjiang project management office under Heilongjiang Provincial Transportation Department.

FINANCIAL REEVALUATION

A. Introduction

1. The financial reevaluation was undertaken in accordance with the *Guidelines for the Financial Management and Analysis of Project (2005)* of the Asian Development Bank (ADB). The project had both revenue and nonrevenue components. Of the project scope, the 206-kilometer (km) four-lane expressway between Yichun and Wudalianchi and the new 13 km class I road between Nenjiang and the provincial border were the revenue component. The nonrevenue component was a class II road section. The financial reevaluation was conducted only on the revenue generating component. The reevaluation period covers the implementation period of 2010–2016 and the operation period of 2012–2033.

B. Basic Assumptions

2. For the calculation of the financial internal rate of return (FIRR), the capital cost is based on actual expenditures incurred for the expressway, excluding the cost of price contingency and interest during construction. The actual capital cost, denominated in local currency, was about 6% higher than the appraisal estimates. The operation and maintenance (O&M) expenses were estimated based on the number of operation and administration staff, average salary levels, and routine maintenance of CNY150,000 per km per year. Periodic maintenance was expected to occur in the 9th year (2022 and 2032) with CNY2 million per km expenditure. Applicable business taxes 3.3% rate were applied on the revenues. Corporate income tax at 25% is paid on income after deducting business taxes, depreciation and interest charges, operating expenses, and prior year losses carried forward within 5 years. The residual value of fixed assets was based on the economic life of the expressway facilities.

3. Current toll rates (Table A10.1), with a base toll of CNY0.45 per passenger car unit (PCU) per km, was the same as - appraisal estimate and used for expressway since 2011. Toll revenues were assumed to increase consistent with the traffic forecast and toll rate increase of 5% every 5 years. Vehicles carrying fresh agricultural produce or livestock and passenger vehicles during national holidays were exempted from tolls. The toll revenue reported for the project was based on a clearance system of Heilongjiang Provincial Transportation Department (HPTD), which was established to allocate the toll collections of all tolled expressways and roads in the province. It was noted that the reported revenues were lower than -amounts calculated based on traffic volumes and applied toll rates. This implied that the reported revenues may have been underestimated due to the revenue clearance system. All revenues and expenses were expressed in 2016 prices for the FIRR calculation.

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

	Vehicle Standards		
Vehicle Type	**Freight Vehicle**	**Passenger Vehicle**	**Toll Rates**
Type 1	M≤2t	N≤7	0.45
Type 2	2t＜M≤5t	8<N≤19	0.80
Type 3	5t＜M≤10t	19<N≤39	1.10
Type 4	10t＜M≤15t	40≤N	1.45
Type 5	15t＜M		1.65

km = kilometer, M = standard freight vehicle load (tonnage), N = standard passenger vehicle seats, t = tonnage.
Source: Heilongjiang project management office.

C. Financial Internal Rate of Return

4. The recalculated FIRR was negative (Table A10.2). The result was mainly due to lower traffic forecast and the low toll revenues. The weighted average cost of capital (WACC) in real terms, was calculated using the actual capital mix and cost of various financing sources, i.e., ADB loan interest rate based on a 10-year fixed swap rate, domestic loans at an interest rate of 4.9%, and the cost of the grant of 8% (Table A10.3). The revised WACC is 2.7%, lower than the appraisal estimate of 3.6%. The project is financially unviable.

Table A10.2: Financial Internal Rate of Return for Revenue-Earning Component

(CNY million)

Year	Capital Cost	O&M Cost	Total Cost	Revenue	Net Cash Flow
2010	852.8	0.0	852.8	0.0	(852.8)
2011	2,346.4	0.0	2,346.4	0.0	(2,346.4)
2012	2,583.6	0.0	2,583.6	9.5	(2,574.1)
2013	559.0	42.3	601.3	20.7	(580.6)
2014	45.3	43.5	88.8	25.0	(63.8)
2015	42.2	44.8	87.0	28.8	(58.2)
2016	101.9	46.2	148.1	28.8	(119.2)
2017	0.0	47.6	47.6	28.9	(18.7)
2018	0.0	49.0	49.0	28.9	(20.1)
2019	0.0	50.5	50.5	29.0	(21.5)
2020	0.0	52.0	52.0	32.8	(19.2)
2021	0.0	53.5	53.5	37.0	(16.5)
2022	986.1	55.0	1,041.1	41.8	(999.3)
2023	0.0	56.8	56.8	47.3	(9.5)
2024	0.0	58.5	58.5	53.4	(5.1)
2025	0.0	60.3	60.3	60.3	0.1
2026	0.0	62.1	62.1	68.2	6.1
2027	0.0	63.9	63.9	77.1	13.1
2028	0.0	65.9	65.9	87.1	21.2
2029	0.0	67.8	67.8	98.4	30.6
2030	0.0	69.9	69.9	110.2	40.3
2031	0.0	72.0	72.0	123.4	51.5
2032	986.1	74.1	1,060.2	138.2	(922.0)
2033	(3,265.6)	74.1	(3,191.5)	152.1	3,343.5
				FIRR=	**–5.4%**

() = negative, FIRR = financial internal rate of return, O&M = operation and maintenance.
Source: Heilongjiang project management office.

Table A10.3: Weighted Average Cost of Capital

	ADB Loan	Domestic Loans	Grant and Equity	Total
a. Weighting	19.0%	46.0%	35.0%	100%
b. Nominal cost	3.1%	4.9%	8.0%	
c. Income tax rate	25.0%	25.0%	0.0%	
d. Tax-adjusted nominal cost [D x (1 – E)]	2.6%	5.4%	8.0%	
e. Inflation rate	1.5%	2.3%	2.3%	
f. Real cost [(1+F) / (1+G) – 1]	0.8%	1.3%	5.6%	
g. Weighted component of WACC	0.2%	0.6%	1.9%	
Weighted average cost of capital				**2.7%**

Source: Asian Development Bank estimates.

D. Operation and Management of Project Expressway and Roads

6. As per the covenants in the project agreement, HPTD should ensure that it (i) maintains a debt service coverage ratio of 1.00 in the first year of operation and 1.20 thereafter; (ii) provides sufficient funding for operation and maintenance of the project expressway and class I road to make up for any shortfall in the cash flow in the initial years of operation; (iii) seeks ADB's concurrence on the proposed toll structure and rates 6 months before the project expressway opens and before seeking [Heilongjiang Provincial Government's (HPG) approval; (iv) provides timely counterpart financing for project components and debt repayment after project completion; and (v) maintains a sound financial management system that includes maintenance of separate accounts and records for the project.

7. Heilongjiang Qiannen Headquarter (Heilongjiang project management office [PMO]) was set up in 2008, responsible for the implementation of the project roads. It has six departments supporting the implementation including engineering, safety, finance, etc. The PMO had set up a reliable financial management system for the project, including maintaining a separate account and records for the project, data processing, and reporting procedures to HPTD and ADB. The annual construction and financial planning of the project was usually prepared in the end of year and used for budget control during the following year after approval by HPTD.

8. The Heilongjiang Provincial Toll-Road Administration Bureau (HPTAB) is responsible for the operation and maintenance (O&M) of the expressway and class I road under the project, while Heilongjiang Provincial Highway Bureau is responsible for the O&M of the class II road. HPTAB is a government unit under HPTD, with responsibility for toll collection and O&M of expressways and class I roads in the whole province. Due to the regionally based operational arrangement, there were no separate financial statements to reflect the financial performance of the project expressway and roads during the operational period. In view of the low financial return of the project at FIRR of -5.4%, HPTD committed that it will make the appropriate financial and operational arrangements to ensure the debt is repaid, closely monitor the financial performance of the project expressway -roads, and take actions as required, including adjusting toll fees to meet the O&M cost and partly depreciation cost.

LAND ACQUISITION AND RESETTLEMENT

A. Background

1. A full resettlement plan for the expressway component of the project was prepared and approved in 2009, during the loan preparation. The plan was updated based on detailed design and submitted to the Asian Development Bank (ADB) in April 2010. According to the updated resettlement plan, construction of the expressway would result in loss of land, houses, and other assets. A total 20,097 *mu*[1] (1,339.8 hectares [ha]) of land was to be acquired permanently by project, of which 7,547 *mu* of farmland was to be acquired permanently and 3,500 households would be affected by permanent land acquisition; a total of 1,936.6 square meters (m^2) of the houses or buildings were to be demolished and would require the relocation of 10 households. In addition, the construction of the expressway would acquire about 2,019 *mu* of temporarily borrowed land for construction purposes. Project cost estimates included a resettlement cost estimate of CNY326.4 million. The land acquisition and resettlement for the road component commenced in May 2009 and was completed by October 2012. The short resettlement plan for the bus station component was prepared in 2009 and updated in 2012. A total of 13,657 m^2 houses and/or buildings, involving 22 households in villages and small towns, were purchased for the construction of 20 rural bus stations.

B. Scope of Land Acquisition and Resettlement

2. According to the resettlement completion report, the expressway permanently acquired 20,361 *mu* (1357.4 ha) of land, an increase of 1.3% compared to the updated resettlement plan. A total of 1,316 m^2 of houses were demolished, 32% less than in the updated plan. A total of 2,600 households were affected by land acquisition and a total of 18 households were affected by house demolition. In addition, the project also temporarily used a total of 4,020 *mu* of land, an increase of 99.1% compared to the estimate in the updated resettlement plan. The decrease in the number of households affected by land acquisition was mainly due to decreased farmland acquisition. The significant increase in temporary land use was due to the higher level of earthworks required during civil works construction. For the bus station component, a total of 13,657 m^2 of empty rural houses were purchased from 22 households to build 20 rural bus stations through renovation and reinforcement. Table A11.1 presents the actual project impacts versus the numbers in the updated resettlement plan.

C. Resettlement Policy and Compensation Rates

3. Land acquisition and resettlement were implemented based on Land Administration Law (1998, amended in 2004) of the People's Republic of China (PRC), ADB's Involuntary Resettlement Policy (1995) and Policy on Indigenous Peoples (1998), the Implementation Measures for the Land Administration Law of the PRC in Heilongjiang Province (2000), Implementation Methods of Integrated Land price in Heilongjiang Province (2009), and Implementation Methods of Integrated Land price in Bei'an City (2010). The compensation rates of permanent land acquisition under the project as compared with the updated resettlement plan are given in Table A11.2. The actual compensation rates of permanent land acquisition are similar with those in the updated resettlement plan.

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

Table A11.1: Project Land Acquisition and Resettlement Impacts

Item	Unit	Impacts		Variation	
		Updated Resettlement Plan	Actual	Quantity	Percentage
A. Permanent Land Acquisition	*mu*	20,097	20,361	264	1.3%
In which: Farmland	*mu*	7,547	6,690	–857	–11.4%
B. Temporary Land Use	*mu*	2,019	4,020	2,001	99.1%
C. Building Demolition	m^2	15,593	14,973	–620	–4.0%
C1. Road Component	m^2	1,936	1,316	–620	–32.0%
C2. Bus Station Component	m^2	13,657	13,657	0	0.0%
D. Affected Households					
D1. By land acquisition	HH	3,500	2,600	–900	–25.7%
D2. By building demolition	HH	32	40	8	25.0%
D21. Road component	HH	10	18	8	80.0%
D22. Bus Station	HH	22	22	0	0.0%

HH =household, m^2 = square meter, mu = 0.07 hectares or 666.67 m^2.
Sources: Updated resettlement plan and resettlement completion report.

Table A11.2: Compensation Rates of Permanent Land Acquisition
(CNY/m^2)

Project Area	Updated Resettlement Plan	Actual Compensation Standard
Nenjiang County	16.08-0.98	19.42-20.98
Wudalianchi City	16.08-38.69	16.08-38.69
Bei'an City	15.8-16.3	15.8-16.8
Suiling County	–	26.84
Yichun City	–	16.9
Moqi League of Inner Mongolia	–	16.3

– = not available.
Sources: Updated resettlement plan and resettlement completion report.

4. Local professional real estate agencies evaluated house compensation. According to the evaluation reports, the actual compensation rates for brick houses ranged from CNY726/m^2 to CNY1,300/m^2, significantly higher than those in the updated resettlement plan. For the adobe houses and temporary houses, the actual compensation rates ranged from CNY350/m2 to CNY653/m^2. A comparison of compensation rates between actual rates and the resettlement plan proposed rates is provided in Table A11.3.

5. According to the project management office (PMO), the total cost of land acquisition and resettlement was CNY413.3 million, a 27% increase from the CNY325.86 million estimated in the resettlement plan. This was caused mainly by higher compensation rates for house relocations and more land tax disbursed for land use certificate.

Table A11.3: Compensation Rates of Houses Subject to Demolition
(CNY/m^2)

Structure	Updated Resettlement Plan	Actual Compensation Standard
Brick house (Grade 1)	550	726–1,300
Brick house (Grade 2)	510	
Brick house (Grade 3)	470	
Adobe house with tile	440	350–653
Adobe house with grass	400	
Temporary house	360	

Sources: Updated resettlement plan and project management office.

D. Rehabilitation and Income Restoration

6. A limited number of houses were demolished under the project. A total of 18 households received full compensation for their houses. Nine affected households in the section of Inner Mongolia did not require relocation as they were located beyond the project boundary; two affected houses in the Wudalianchi section were non-residential and did not require reconstruction. Seven affected households in Yuejing Forest Farm under Suiling Forest Bureau requested relocation and resettlement. Among them, two affected households constructed their new houses, two households purchased second-hand houses for resettlement, two households live respectively with their parents or adult children, and one other household was resettled in Suiling county town. Each household also received CNY500 as a transitional allowance in addition to the compensation for their houses.

7. Given the abundant farmland resources in the project area, the impacts caused by land acquisition were not serious as affected households still had adequate farmland. In the affected villages, the affected households received compensation for their lands, which some invested in agriculture production. In addition, many agriculture cooperatives were established in the project area. Some farmers leased their lands to these agriculture cooperatives on a voluntary basis and chose to work for the cooperatives as a worker. For the state farms or forest farms, the impact of land acquisition was even less as the available land for reallocation was larger. The land reallocation is conducted internally with state farms or forest farms, while farmlands are assigned annually to their workers through auction by tender. The assessment on income restoration conducted by the external monitor showed that the average annual growth of per capita net income in those affected villages/farms was 9.9% from 2009 to 2015 (Table A11.4).

F. Information Disclosure, Consultation, and Participation

8. Throughout implementation, the Heilongjiang Provincial Transport Department openly shared information and consulted with affected villages, groups and people on land acquisition, house demolitions, compensation, relocation, and rehabilitation including (i) disclosed to and confirmed the detailed results of the measurement survey with affected people, villages, and groups in line with the survey progress, from May 2009 to December 2010; (ii) clarified and explained the resettlement policy and compensation standards on May 2009; (iii) prepared and disseminated the resettlement information booklets that introduced the project impacts, policy, compensation standard, timetable, consultation prior to resettlement implementation; (iv) organized meetings to discuss the issues of land acquisition and resettlement throughout; and

(v) established a grievance appeal mechanism. No grievance was received during implementation.

Table A11.4: Income Restoration of Affected Villages

	2009		2015		
Affected Village/Farm	Population	Per Capita Net Income(CNY)	Population	Per Capita Net Income(CNY)	Annual Growth Rate of Per Capita Net Income（%）
Shengli Village	2,350	5,200	2,348	9,500	10.6%
Changjiang Village	2,080	2,700	2,082	5,800	13.6%
Xinghuo Village	1,718	5,200	1,717	9,850	11.2%
Sihe Village	1,865	5,300	1,866	9,990	11.1%
Dongfeng Village	4,011	6,100	4,003	10,000	8.6%
Beihe Village	2,749	5,888	2,745	10,150	9.5%
Yuejin Wood Farm	416	10,000	415	13,000	4.5%
Total/Weighted Average	15,189	5,364	15,176	9,437	9.9%

Source: Resettlement completion report.

G. Institutional Arrangement

9. Under agreements with the PMO, several agencies were responsible for the implementation and management of the land acquisition and resettlement program. These agencies included the PMO's resettlement coordination unit, land resources bureaus in five cities/counties, two forest bureaus, two farm administration bureaus, and township governments along the road alignment. The agencies also conducted detailed measurement surveys, disclosed land acquisition and resettlement policy, and compensation standards, and consulted, negotiated, and signed compensation and resettlement agreements with affected households, paying the compensation and assisting affected households in the reconstruction of new houses as well as in income restoration. Over one hundred staff of PMO and government agencies were invoved in land acquisition and resettlement and their capacity were further strengthened through Asian Development Bank's (ADB) mission and consultation.

H. Monitoring and Evaluation

10. WINLOT Consulting Ltd. was engaged in external monitoring and evaluation (M&E) of land acquisition and resettlement implementation. The external resettlement M&E for the expressway has been conducted regulary. ADB received five resettlement M&E reports from 2010 to 2013 and a resettlement completion report in 2015. The external monitoring reports indicated that income restoration has been achieved in those affected villages/farms.

I. Lessons

11. The lessons learned from the implementation of land acquisition and resettlement included (i) strong capacity of the PMO and resettlement offices under local land resources bureaus along the road alignment, (ii) fair compensation policy and adequate resettlement measures were implemented in a transparent manner, and (iii) the land acquisition and resettlement fund was adequate and paid in a timely manner.

SOCIAL, POVERTY, AND ETHNIC MINORITY DEVELOPMENT

A. Introduction

1. The social impacts and poverty reduction analysis conducted during project preparation indicated that the project would generate social and economic benefits for local residents and governments including (i) transport cost and time savings; (ii) traffic accident cost savings; (iii) improved access to health care and social services; (iv) direct job opportunities during construction and maintenance works; (v) new economic opportunities for local forest workers who lost their jobs due to the national policy on preserving forest resources; (vi) increased local demand for building materials, construction machinery, and transport during civil works; (vii) increased information flow; (viii) facilitation of tourism development; (ix) reduced vehicle emissions; and (x) an enabling environment for private sector participation. The project would contribute to poverty reduction by (i) promoting ecotourism in Wudalianchi Scenic Area and Yichun forestry areas, and (ii) facilitating the more efficient flow of agricultural products and non-timber forest products to market. A Social Development Action Plan (SDAP) was prepared and implemented to enhance the project benefits to local communities and people in the project area.

B. Sustainable Socioeconomic Growth in the Project Area

2. The project construction contributed to the socioeconomic development in the project area. The project invested a total of CNY6.7 billion in the area in the 3 years from 2010 to 2012. This contributed to the local economic development, particularly for suppliers, construction materials, and the services sector. The statistical data shows that socioeconomic conditions in the project area have improved rapidly in recent years. From 2009 to 2015, the gross domestic product grew at an average 11.1% per year while the government fiscal revenues in the project areas grew at an average 9.1% per year (Table A12.1 and Table A12.2).

Table A12.1: Gross Domestic Product Growth in the Project Area
(CNY billion)

County/City	2009	2010	2011	2012	2013	2014	2015	Growth	Annual
Nenjiang County	9.04	11.13	13.00	15.27	16.61	17.82	18.89	109%	13.1%
Wudalianchi City	3.56	4.10	5.18	6.28	6.91	7.68	8.14	128%	14.8%
Bei'an City	4.91	5.59	6.99	8.33	9.01	10.00	10.78	120%	14.0%
Suiling County	2.18	3.00	4.18	5.41	6.26	6.65	6.98	220%	21.4%
Yichun City	17.24	20.24	22.97	26.01	28.45	26.16	24.82	44%	6.3%
Total	**36.9**	**44.1**	**52.3**	**61.3**	**67.2**	**68.3**	**69.6**	**88%**	**11.1%**

Source: Heilongjiang Province Statistics Yearbook, 2009–2015.

Table A12.2: Government Fiscal Revenues Growth in the Project Areas
(CNY million)

County/City	2009	2010	2011	2012	2013	2014	2015	Growth	Annual
Nenjiang County	257.0	482.0	550.0	640.0	578.0	617.0	619.0	141%	15.8%
Wudalianchi City	48.9	77.6	114.5	142.8	168.7	182.4	237.8	386%	30.2%
Bei'an City	230.9	327.1	467.2	611.5	641.4	754.6	835.8	262%	23.9%
Suiling County	72.0	150.0	250.0	330.0	375.5	308.9	390.2	442%	32.5%
Yichun City	1,468.2	2,030.0	2,466.2	3,018.6	2,458.3	2,031.5	1,425.6	-3%	-0.5%
Total	**2,077.0**	**3,066.7**	**3,847.8**	**4,742.9**	**4,221.9**	**3,894.3**	**3,508.4**	**69%**	**9.1%**

Source: Heilongjiang Province Statistics Yearbook, 2009–2015.

3. Construction and operation of the expressway have provided an advantage for local governments to attract external investments to contribute to local industrial development along the expressway. More enterprises have started or expanded operations along the expressway alignment. Project areas that did not have expressway connections before construction of the expressway, experienced a significant increase in the amount of external investments. For example, Bei'an City attracted a total of CNY6.77 billion of external investments in 2015, which constitutes an average increase of 42.7% annually from 2009 to 2015 (Table A12.3). In addition, the establishment of more enterprises has played an important role in providing employment to local people.

Table A12.3: External Investments in the Project Areas
(CNY million)

County/City	2009	2010	2011	2012	2013	2014	2015	Growth	Annual
Nenjiang County	1,300	1,596	1,956	2,591	4,156	5,501	4,745	265%	24.1%
Wudalianchi City	700	1,101	1,420	1,820	2,542	3,358	2,205	215%	21.1%
Bei'an City	803	1,002	1,509	2,510	4,002	5,810	6,770	743%	42.7%
Suiling County	–	–	3,909	7,753	7,575	7,530	7,375	89%	17.2%
Yichun City	5,673	13,263	20,224	21,313	21,553	12,385	6,522	15%	2.4%
Total	**8,476**	**16,962**	**29,018**	**35,987**	**39,828**	**34,584**	**27,617**	**226%**	**21.8%**

– = no data available.
Source: Project management office.

C. Increased Rural Income and Poverty Reduction

4. According to statistics of the county governments, the growth of farmers' per capita income ranged from 94% to 125% in the project area from 2009 to 2015 (Table A12.4). A trend analysis of rural income growth in the counties/districts along the expressway alignment indicates that the speed of rural income growth in the poor counties, such as Suiling County, was higher than in other areas, except for Bei'an City. This indicates that development in the project area is gradually being rebalanced. In addition, the poverty incidence also declined in the project area (Table A12.5).

Table A12.4: Rural Per Capita Income in Project Area
(CNY/person)

County/City	2009	2010	2011	2012	2013	2014	2015	Growth	Annual
Nenjiang County	6,156	8,057	9,665	8,952	9,955	10,982	11,970	94%	11.7%
Wudalianchi City	6,300	7,308	9,430	8,745	9,781	11,101	12,322	96%	11.8%
Bei'an City	5,185	5,807	7,607	8,465	9,498	10,733	11,642	125%	14.4%
Suiling County	3,280	3,875	4,288	4,865	5,545	6,377	6,983	113%	13.4%
Yichun City	6,139	7,280	8,630	9,232	10,155	11,368	12,001	95%	11.8%

Source: Heilongjiang Province Statistics Yearbook, 2009–2015.

Table A12.5: Poverty Incidence in Project Area
(%)

County/City	2009	2010	2011	2012	2013	2014	2015	Decline	Annual
Nenjiang County	15.50	14.17	11.57	9.47	9.14	9.00	6.37	–59%	–13.8%
Wudalianchi City	3.90	5.14	4.87	4.15	3.97	3.52	3.34	–14%	–2.6%
Bei'an City	4.45	4.40	4.56	4.43	4.21	4.13	4.05	–9%	–1.6%

Note: the poverty incidence in Suiling county and Yichun City are not available.
Source: Project management office.

D. Tourism Development

5. The project areas are rich in tourism resources. The opening of the expressway in 2012 created the basic link between two tourism cities, allowing the tourists of Yichun City to travel to Wudalianchi City directly. The tourism resources along the expressway include one national key cultural relics protection unit, two national nature reserves, 14 national AAAA and AAAAA tourism spots, and five national industrial and agricultural tourism demonstration spots (Table A12.6). The statistics show that the tourism incomes in Wudalianchi City have increased by 76%, Wudalianchi Scenic Spot by 74%, and Yichun City by 41% between 2012 and 2015 (Table A12.7).

Table A12.6: Tourism Resources along the Alignment of Expressway
(Number)

Area	National Key Cultural Relics Protection Unit	National Nature Reserve	National Forest Park	National 4A and 5A Tourism Spot	National Industrial and Agricultural Tourism Demonstration Spot
Wudalianchi City	0	1	0	2	3
Yichun City	1	1	1	12	2
Alignment	1	2	1	14	5

Source: Project management office.

Table A12.7: Tourism Income in Project Area
(CNY billion)

County/City	2012	2013	2014	2015	Growth	Annual Rate
Wudalianchi City	0.41	0.49	0.59	0.72	76%	20.8%
Wudalianchi Scenic Spot	0.26	0.32	0.41	0.46	74%	20.3%
Yichun City	4.36	4.90	5.36	6.14	41%	12.1%
Total	5.03	5.72	6.36	7.32	45%	13.3%

Source: Project management office.

E. Job Creation

6. Local employment was promoted during project construction. According to the external monitor, project construction provided work for 28,832 person-days, of which 23,636 person-days came from the local labor market. Among the local employment, 4,376 person-days (19%) of work went to female workers. Daily wages ranged from CNY60 to CNY100 in the period 2010–2012. (Table A12.8).

Table A12.8: Labor Employment during Construction

	Labor	Local labor (person-days)				Average Wages (CNY/person-day)	
County/City	(person-days)	Subtotal	Poverty	Minority	Female	Minimum	Maximum
Nenjiang County	5,955	4,896	129	38	892	60	100
Wudalianchi City	5,604	4,586	124	36	858	60	100
Bei'an City	5,305	4,298	123	36	848	60	100
Suiling County	4,886	3,997	109	32	748	60	100
Yichun City	7,082	5,859	149	44	1,030	60	100
Total	**28,832**	**23,636**	**634**	**186**	**4,376**	**60**	**100**

Source: External monitor.

7. Locally procured construction materials and supplies also provided job opportunities in the project area. According to the social and poverty monitoring reports, (i) a total of CNY2.9 million was spent on renting houses by the contractors, which contributed to the income growth of local people along the road alignment, (ii) a total of 1,938 construction machines from local farmers were leased to contractors earning the local farmers around CNY93 million, and (iii) a total of 2,568,572 cubic meters (m^3) of sand, 859,400 m^3 of stones, 16,275 tons of cement, 19,190 tons of reinforcing bars, 5,838,500 m^3 of earthworks, as well as other raw materials and agricultural and sideline products were purchased locally during the road construction, Both material procurement and personal consumption also stimulated local economic development, provided indirect job opportunities, and increased the income of poor families.

8. Since the expressway opened to traffic in October 2012, local workers have been hired to work as tellers, security guards, and maintenance staff for the service stations and expressways. A total of 72 jobs had been created by the end of 2015 (Table A12.9). With the growth in traffic, more direct, indirect, and induced employment opportunities will be generated for local workers, particularly, the poor.

Table A12.9: Labor Employment during Operation
(As of end 2015)

		Of which:			
Work Station	**Number of Staff**	**Female**	**%**	**Poverty**	**%**
Wudalianchi	20	7	35%	0	0%
E'erhe	13	2	15%	5	38%
Kunlunqi	13	0	0%	7	54%
Jianxing	14	1	7%	6	43%
Hongxing	12	2	17%	6	50%
Total	**72**	**12**	**17%**	**24**	**33%**

Source: Project management office.

F. Time-saving Travel and Mobility Improvement

9. The improved transport service has saved the travel time and improved the mobility of local people in the project area. The project management office (PMO) conducted a survey on two sampled locations along expressway alignment. The average travel times from the sampled locations to major destinations have decreased by 29%–67%, which have significantly improved the mobility of local people. The increased travels to those major destinations ranged from 100% to 500% after project opening to traffic (Table A12.10).

Table A12.10: Time Saving and Mobility Improvement

Passengers in the Sampled Locations	**Before the Project**				**After Project Completion**			**Time Saving**		**Improved Mobility**	
	Destination	**Distance**	**Time**	**Frequency**	**Distance**	**Time**	**Frequency**	**Time**	**Percentage**	**Frequency**	**Percentage**
		(km)	(Hour)	(time/year)	(km)	(Hour)	(time/year)	(Hour)	(%)	(time/year)	(%)
Yaojing Forest Station	Yichun City	125	6.0	1	125	2.0	4	4.0	67%	3	300%
	Bei'an City	220	7.0	1	175	2.5	6	4.5	64%	5	500%
	Suiling County	120	3.5	3	120	2.0	8	1.5	43%	5	167%
	Harbin City	400	7.5	1	380	4.5	3	3.0	40%	2	200%
Geqiushan Farm	Yichun City	320	7.0	0	320	4.0	1	3.0	43%	1	–
	Bei'an City	120	3.5	2	100	2.0	6	1.5	43%	4	200%
	Wudalianchi City	70	3.0	4	58	1.0	8	2.0	67%	4	100%
	Nenjiang County	80	3.5	2	80	1.5	8	2.0	57%	6	300%
	Harbin City	460	8.5	1	420	6.0	4	2.5	29%	3	300%

Source: Project management office.

10. A total of 20 rural bus stations were constructed in 20 small townships in Bei'an City, Beilun City, and Keshan County. The rural bus stations were constructed to enable rural passengers in remote areas to take the bus to the expressway. According to the PMO, around 0.7 million rural people have directly benefited from the project through improved public transportation facilities.

G. Gender Development

11. The construction and operation of the expressway have promoted gender development in the project area. During project construction, a total of 4,376 person-days of work went to female workers, accounting for 19% of total workers recruited. Female employees enjoyed wages equivalent to those of male employees for similar jobs. During expressway operation, 12 permanent jobs in workstations have been provided to women. With new enterprises established in the project area, more girls and women are being employed. The improvement of traffic connections also enables women to work as migrant laborers outside the region and increase their income.

H. Ethnic Minority Development

12. There are around 9,000 ethnic minorities living in the project area, accounting for 1.7% of total population. They mainly include Hui, Mongolian, and Korean. The socioeconomic status of minority people is like that of Han people, enjoying a series of preferential policies, specifically issued by the Government of the People's Republic of China (PRC). No ethnic minority development plan was prepared. Sufficient actions were included in the SDAP. Adverse impacts of land acquisition and mitigation measures were addressed in the resettlement plan and the enhancement measures of the project benefits were discussed in the social development action plan. Minorities also benefit equally from the improved road and transport facilities and services.

I. Monitoring and Evaluation

13. The WINLOT Consulting Ltd. was engaged as the external agency to conduct monitoring and evaluation of the implementation of the social development action plan for the project. The external monitor prepared and submitted three social monitoring reports to ADB from 2010 to 2013. These reports concluded that the construction and operation of the expressway contributed to the regional socioeconomic development, poverty reduction, gender development, and ethnic minority development.

J. Conclusions

14. The project has had positive impacts on regional socioeconomic development and poverty reduction, including through (i) contribution to the growth of gross domestic product, governments' fiscal revenues, and poverty reduction in the project area; (ii) reduced travel time and improved mobility of local people; (iii) job creation during expressway construction and operation; (iv) facilitation of tourism development in Wudalianchi Scenic Area and Yichun forestry areas and creation of new employment opportunities for local forest workers; and (v) improved gender development and ethnic minority development.

ENVIRONMENTAL IMPACT ANALYSIS

A. Introduction

1. The Second Heilongjiang Road Network Development Project consisted of three sections of expressway and roads totaling 347.15 kilometers (km), which included (i) construction of the 205.90 km Yichun–Wudalianchi four-lane expressway (163.42 km between Yichun and Bei'an East and 42.48 km between Bei'an West and Wudalianchi); (ii) upgrade of a 128.17 km gravel road between Longzhen and Nenjiang to class II highway; and (iii) completion of the new 132.08 km class I road between Nenjiang and the provincial border with Inner Mongolia. The project also included (i) the construction of 101 bridges with total length of about 10.49 km, and 328 culverts; (ii) construction of 4.3 km of three class I and class III branch roads, and (iii) construction of 16 new bus stations and rehabilitation of four bus stations in four counties and three prefectures. In line with the Asian Development Bank's (ADB) Environment Policy (2002) and Environmental Assessment Guidelines (1998), the project was classified as category A for environmental safeguards.

2. The environmental impact assessment (EIA) report[1] for the project's expressway prepared by Environmental Protection Center of the Ministry of Transport on behalf of the Heilongjiang Provincial Transportation Department (HPTD), was prepared using methodologies and standards consistent with guidelines established by the State Environmental Protection Administration (formerly the Ministry of Environmental Protection) and the Ministry of Communication of the People's Republic of China (PRC), and in compliance with applicable laws and regulations. The Heilongjiang Environmental Protection Bureau approved the expressway's EIA report in May 2009. The Heilongjiang Water Resource Bureau approved three separate soil erosion protection plans (SEPPs) for three sections of the expressway in January 2009.[2] The summary environmental impact assessment (SEIA) report circulated to ADB in September 2009 was prepared based on information contained in the approved domestic EIA and SEPPs. The project preparatory technical assistance consultant prepared an environmental assessment and review framework for the subprojects of the road rehabilitation component. The SEIA concluded that the anticipated adverse environmental impacts of the project would be minimized to acceptable levels by implementing credible and timely environmental mitigation and monitoring programs as stipulated in the environment management plan (EMP).

3. Following national regulations, Ministry of Water Resource conducted completion and acceptance reviews for three SEPPs by July 2014, which were approved by the Heilongjiang Water Resource Bureau by August 2014. The Heilongjiang Environmental Protection Bureau carried out the completion and acceptance review for the environmental protection measures in January 2015.

B. Environmental Protection and Management

4. As the executing agency, the HPTD was responsible for establishing the environmental management system. The Heilongjiang Qiannen Highway Construction Management Office (PMO), the Heilongjiang Provincial Highway Bureau (HPHB) and the Heilongjiang Provincial Transportation Administration Bureau (HPTAB) were the three implementing agencies

[1] People's Republic of China. Ministry of Communication. 1998. *Environmental Protection of Roads*. Beijing.
[2] Hei*shuibaohan [2009] 6*

responsible for coordinating environmental management. With the consultant's assistance, HPTD established the environmental protection and soil erosion control leading group and an environmental protection and soil erosion control office (the office) to oversee the EMP implementation and to deal with environmental issues involving contractors and local communities. Each contractor's office had a designated environment engineer responsible for verification and mitigation of environmental impacts during the construction and defects liability period. Training on environmental management was conducted for project management staff, contractors, and engineers.

5. Environmental and soil erosion control specification clauses were included in the contracts signed between implementing agencies and contractors during construction. Guidelines were set for the acquisition of temporary occupied land and the transportation and storage of waste material. During the project preliminary preparation and detailed design, the alignment of the project expressway was carefully screened, taking into account the ecological and socioeconomic environment. The engineering design was improved to minimize the environmental impacts.

C. Environmental Monitoring

6. Contractors and construction supervision companies conducted daily environmental monitoring activities on site. The environment monitoring specialist conducted periodic environmental monitoring and took samples for analysis in accordance with the EMP monitoring procedures and guidelines.

7. During project implementation, PMO engaged Shanxi Environment Monitoring & Testing Center of Communications as the external environmental monitoring agency to verify the environmental impacts of the construction. The external monitoring agency also monitored the noise, air, and surface quality in designated sites according to the environmental monitoring plan in the SEIA. PMO reported 10 semi-annual environmental management reports to ADB and uploaded these on ADB's website. The contractors implemented the EMP and SEPP effectively during construction and operation. The monitoring results showed no significant environmental damage during project construction and operation.

D. Implementation of Mitigation Measures

8. During implementation, the external monitoring agency carried out environmental monitoring and mitigation measures according to the EMP and the SEPP. The following measures minimized adverse environmental effects (i) reusing 5,541,089 cubic meters (m^3) of spoil from tunnels and other excavations for embankment filling; (ii) minimizing excavation and potential erosion by optimizing the design of bridge substructures; (iii) applying integrated revegetation and structural methods to recover 7,939,900 square meters (m^2) of cutting slopes and embankments; (iv) rehabilitating 21 borrow pits and three spoil dumps by using excavated topsoil; and (v) installing wastewater collecting and treatment facilities in five toll stations, three parking lots and five service area to reduce water pollution.

9. Appraisal estimated that the environmental management cost would be CNY310.91 million. According to the approved project environmental completion and acceptance review report, due to material and labor price fluctuation, the actual investment for environmental protection was CNY276.26 million—4.11% of total investment—which included slope stabilization, ecological rehabilitation, spoil sites re-vegetation, and soil and water conservation measures.

10. **Soil Erosion.** During construction, 3,045,315 m^3 of excavated materials were disposed of at three disposal sites and refilled borrow pits. However, the borrow pits and disposal sites were carefully selected again to minimize the number of sites along the expressway alignment, thus minimizing land disturbance. The actual number of borrow sites was reduced to 21 from 54 proposed in SEPP. All disposal sites and borrow pits have been restored and rehabilitated using retaining structures, drainage systems, and revegetation. During operation, solid waste production is minor. Cleaners appointed by HPTD are responsible for collection and disposal of solid waste according to local regulations.

11. **Ambient Air Quality.** During construction, air pollution was caused mainly by dust from cement mixing and transportation. Mitigation measures were fully implemented as required in the EMP, which included water spraying, covering of transported materials, and good machinery maintenance. During operation, the negative impacts on air quality are limited to vehicle emissions. The external monitoring agency conducted monitoring activities for the sensitive points identified in the SEIA. The monitoring results for vehicle emissions show that the level of nitrogen dioxide is below the grade II limits of the national ambient air quality standards (GB3095–2012). Coal and kerosene were used for the winter heating service facilities in the management center, toll stations, and service areas, which may have negative impacts on the local ambient air quality. As checked, all coal-fired boilers are equipped with dust collection systems, and guidelines direct that high-quality coal compliant with environmental requirements should be selected. Oil smoke cleaning systems are also used in the kitchen of the service areas. The monitoring results of boilers' operation show that the levels of sulfur dioxide, nitrogen oxide, and dust are below the grade II limits of the national ambient air quality standards for boilers (GB13271–2001).

12. **Water Quality.** During construction, adverse impacts on surface water were limited, caused mainly by siltation and waste from construction sites and workers' camps. All proposed mitigation measures have been undertaken appropriately. During operation, roadway runoff is diverted to the drainage system. Wastewater from toll and monitoring stations is collected and treated before discharge. Soil protection works are inspected regularly to ensure the network's good condition and effective functioning. Taking into account the three tap-water intakes, the expressway adjusted the alignment to avoid impacts at Numin River surface drinking water source reserve, Shuangquan underground drinking water reserve, and Nenjiang water resource. No construction activities, disposal sites or borrow sites were set in or close to the protected areas. For bridges across rivers, runoff collection pipes and water storage tanks were designed and installed.

13. **Noise.** Effective mitigation measures were conducted to reduce the environmental impact of noise. During construction, contractors used low-noise equipment and adopted mitigation measures to reduce noise at sensitive locations mentioned in the EIA. According to the investigation during PPTA stage, seven sites were identified as having potential noise problems during operation due to realignment. To mitigate the impact of noise, 1,047 meters of sound abatement barriers were installed at three sites. According to the environmental monitoring results, the measured noise levels at 15 sensitive points complied with the relevant standards, such as the Standard of Environmental Noise of Urban Areas (GB 3096-2008). HPTD will conduct further assessments to guarantee that appropriate measures will be put in place to mitigate impacts to acceptable level despite traffic volume increase in the future.

14. **Ecological Environment.** Taking into account the three natural reserve protection areas, the expressway adjusted the alignment to avoid impacts at Shuilingnuer River provincial nature

reserves, Bei'an provincial nature reserves and Wudalianchi national nature reserves. No construction activities, disposal sites or borrow sites were set in or close to the protected areas. No effects on natural habitats were observed during the project construction and operational phases. During construction, contractors carried out environmental protection in accordance with environmental protection clauses stipulated in their contracts. All sites temporarily occupied during construction were restored. Cutting surfaces, subgrades, and embankment slopes were generally stabilized using appropriate vegetative and structural measures such as retaining walls, riprap, antiskid piles, rock bolts, and side ditches to prevent soil erosion. Spoil banks have been covered with vegetation to control erosion. All access roads were rehabilitated and handed over to local governments as local roads. Before the handover, HPTD conducted revegetation along the access road. The project occupied 1,503.62 hectares permanently and 455.21 hectares temporarily. All lands have been restored or compensated for. All targets for soil and water conservation have been met according to national regulations.

15. **Road Safety and Maintenance.** To reduce the accident rate along the expressway, HPTD introduced road safety measures, such as safe design, and safety facilities installation. During operation, HPTD conducts continuous road maintenance activities.

E. Environmental Benefits

16. The project reduced the travel distance from Wudalianchi to Yichun by around 400 km. The estimated fuel savings for the 20-year operating period are 200.06 million liters. The estimated carbon dioxide (CO_2) emission reductions for the first 20 years are 0.589 million tons.

17. As a result, estimated emissions of CO_2 emissions will be reduced by 212,528-ton carbon dioxide equivalent (CO_{2e}) in the first year of operation. Sulfur dioxide (SO_2) and nitrogen dioxide emissions will also be reduced during operation.

F. Conclusion

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